Blackmagicdesign

New Features Guide

DaVinci Resolve

November 2020 Public Beta

English

Leading the Creative Video Revolution

Welcome

Welcome to DaVinci Resolve for Mac, Linux and Windows!

DaVinci is the world's most trusted name in color and has been used to grade more Hollywood films, TV shows, and commercials than anything else. Now, with DaVinci Resolve, you get a complete set of editing, advanced color correction, professional Fairlight audio post production tools and now Fusion visual effects combined in one application so you can edit, compose, grade, mix and master deliverables from start to finish, all in a single tool!

DaVinci Resolve has the features professional editors, colorists, audio engineers and VFX artists need, and is built on completely modern technology with advanced audio, color and image processing that goes far beyond what any other system can do. With this release, we hope to inspire creativity by letting you work in a comfortable, familiar way, while also giving you an entirely new creative toolset that will help you cut and finish projects at higher quality than ever before!

We hope you enjoy reading this new features guide which highlights new features in the public beta. With its customizable interface and keyboard shortcuts, DaVinci Resolve is easy to learn, especially if you're switching from another editor, and has all of the tools you need to create breathtaking, high end work!

The DaVinci Resolve Engineering Team.

Grant Petty

Grant Petty
CEO Blackmagic Design

Navigation Guide

Contents

Hover over and click the Contents Heading and it opens the Main Content Page at the beginning of the manual

Hover over and click each title and it opens the Page accordingly

Hover over and click the footer on each page and it opens the Chapter Content Page

Contents

Chapter 1

General Improvements

DaVinci Resolve 17 introduces many improvements that extend to all the different pages in the program. In addition, there have been fundamental changes and enhancements made to DaVinci Resolve's basic functionality.

Contents

Overall Interface Improvements

This section covers some of the most visible improvements to the DaVinci Resolve user experience.

Transitions, Titles, and Effects Thumbnail View

In order to make the selection of Transitions, Titles, and Effects more intuitive, DaVinci Resolve now shows each effect as a thumbnail representation in addition to the text name. This allows the user to quickly scan through all the numerous options to select the appropriate effect visually, rather than remembering them based on name alone. You can now preview transitions and titles before you place them on the Timeline to quickly audition multiple options before making your final decision.

Transitions Thumbnails

To preview a transition before you place it into the Timeline, ensure that "Hover Scrub Preview" is checked in the Transitions option menu, then simply hover your pointer over any transition in the Transitions tab and move it across the thumbnail. The transition will preview in the Viewer using the two clips nearest the smart indicator in the Cut page, or the two clips nearest the the playhead in the Edit page.
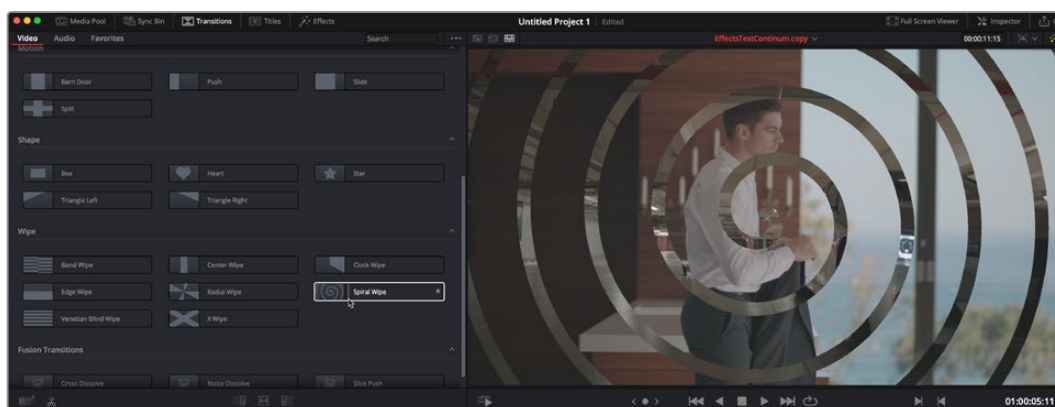
Scrubbing over a Transition Thumbnail previews the transition in the Viewer.

Once you've chosen your transition, it can be applied by dragging it from the Transitions tab to any edit point on your Timeline in the Edit page. In the Cut page, you can either select the thumbnail and then select one of the transition alignment tools at the bottom of the Transitions tab, or drag it directly to an edit point in the upper or lower Timelines.

Titles Thumbnails

To audition titles before you place them into the Timeline, ensure that "Hover Scrub Preview" is checked in the Titles option menu, then simply hover your pointer over any thumbnail in the Titles tab. If the title is animated (i.e., Fusion titles), moving the pointer across the thumbnail will preview the animation. Once you've chosen your title, you can drag it from the Titles tab to your Timeline in the Edit page or in the Cut page to either the upper or lower Timelines, or use the editing selection modes at the bottom of the tab.

Scrubbing over a Title Thumbnail previews the title in the Viewer

Effects Thumbnails

A thumbnail icon now represents each specific effect available in DaVinci Resolve.

Video Effects

To preview a video effect before placing it on a clip, ensure that "Hover Scrub Preview" is checked in the Effects option menu, then simply hover your pointer over any thumbnail in the Effects tab and move it across the thumbnail. The effect will preview in the Viewer using its default parameters, and scrub through the clip that is selected in the Timeline. If no clip is selected then it will use the clip currently under the playhead.

To activate a specific video effect on a clip, simply drag the thumbnail of the selected effect to a clip on the Timeline. To adjust the effect's parameters, open the Effects tab in the inspector.

Scrubbing over an Effect Thumbnail previews that effect in the Viewer

Audio Effects

To activate a specific audio effect on a clip, simply drag the thumbnail of the selected effect to a clip on the upper or lower Timelines in the Cut page, or onto a clip in an audio track on the Edit page. Once the effect has been dropped on a clip, its audio plug-in controls will open for you to adjust the plug-in's parameters.

Generators

The various video generators included in DaVinci Resolve can be previewed by hovering your pointer over any thumbnail in the Generators tab. To edit a generator into your timeline, simply grab the thumbnail of the generator you wish to use, and place it in your Timeline in the Edit page, or in either the upper or lower Timelines in the Cut page.

Improved Inspector

The inspector has been redesigned for the Media, Cut, Edit, and Fairlight pages to make it easier to find specific controls and to adjust common settings for your clips. Instead of a long vertical list, different aspects of the inspector have now been organized into panels, with each controlling specific grouped sets of parameters for your clip. Inspector panels that are not applicable to your clip are grayed out.

Methods of using controls in the inspector:

- **To activate or deactivate a control:** Click the toggle to the left of the control's name. The orange dot on the right means the control is activated. A gray dot on the left means the control is deactivated.

- **To reveal a control's parameters:** Double-click the control's name.

- **To reset controls to their defaults:** Click the reset button to the right of the control's name.

Video

The Video tab consists of commonly used controls to modify the size, opacity, motion, and timing of your clip. This tab is composed of the Composite, Transform, Smart Reframe, Cropping, Dynamic Zoom, Stabilization, Speed Change, Retime and Scaling, and Lens Correction controls. Smart Reframe is a new feature that's described later in this document. All other controls are described in detail in the DaVinci Resolve Reference Manual.
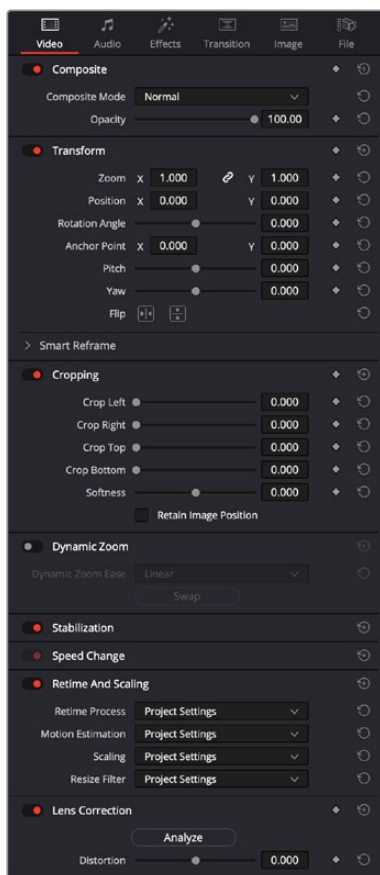
The Video Inspector parameters

Audio

The Audio tab contains four commonly used audio controls for video editing purposes, including Clip Volume, Clip Pan, Clip Pitch, and Clip Equalizer. All of these controls are described in detail in the DaVinci Resolve Reference Manual.

> **NOTE:** There are many more refined plug-ins and effects for audio clips in the Audio FX library. If you apply any of these, the controls will appear in the inspector's Effects tab Audio section, instead of here.
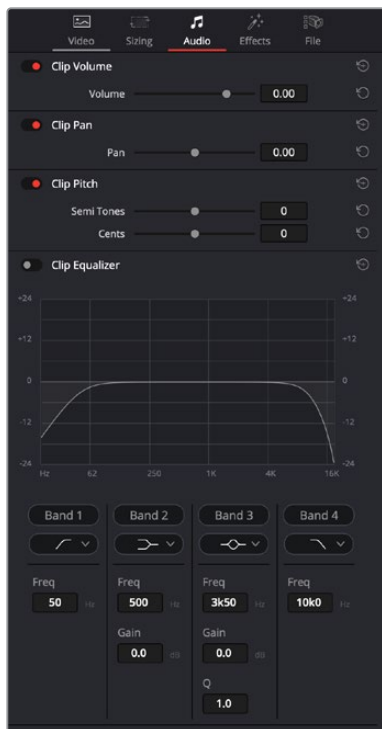
The Audio Inspector parameters

Effects

If a clip has any effects assigned to it, the controls for those effects will show up here. The effects will be further sub-grouped by type: Fusion, Open FX, or Audio. In the Cut page, you can now drag an effect directly into the this Inspector panel to apply it to a clip. If a clip does not have any effects assigned to it, this panel will be dimmed. All effects are described in detail in the DaVinci Resolve Reference Manual.
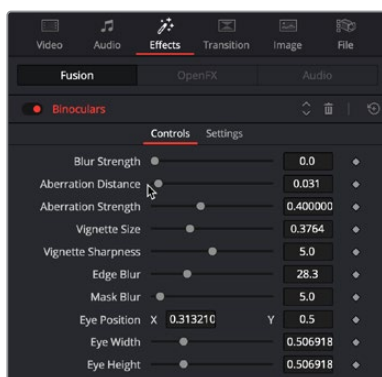
The Effects Inspector parameters
for the Binoculars effect

Transition

This panel lets you adjust the parameters of a selected transition. The transition type can be changed in the drop-down menu, and each transition exposes a set of parameters unique to that specific transition. All transitions are described in detail in the DaVinci Resolve Reference Manual.
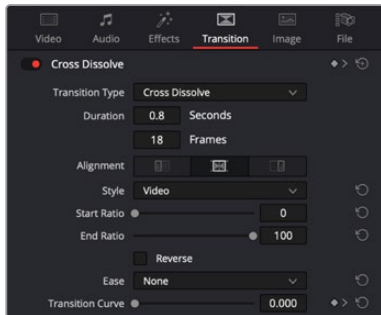
The Effects Inspector parameters for the Cross Dissolve transition

Image

The image panel exposes the Camera Raw parameters. If the video clip is in a Raw format, the specific camera's Raw controls will be exposed for user manipulation. Raw still images from Nikon and Canon cameras can also be adjusted in this panel. Camera Raw controls are explained in detail in the DaVinci Resolve Reference Manual.
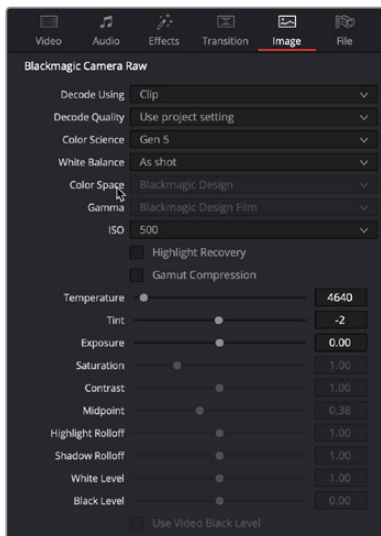
The Image Inspector for a Blackmagic RAW file

File

The File tab provides a consolidated way of to view and edit media file metadata. The tab is composed of the following parts:

- **Clip Details:** Presents data about the clip's data format (codec, resolution, frame rate, etc.).
- **Metadata:** Presents a reduced set of common metadata fields for quick user entry.
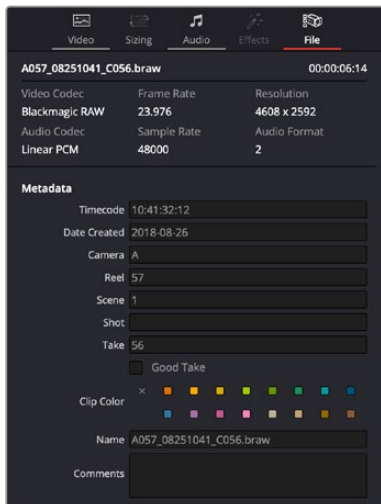
The File Inspector parameters

Show Panel in Workspace Submenu

You can now assign keyboard shortcuts to show and hide individual panels in your workspace for instant configuration of the UI. The panels, such as Inspector, Media Pool, Metadata, etc., are dependent on which page you are working in. Keyboard shortcuts to toggle these panels on or off can be assigned using the Keyboard Customization window. Alternatively, you can choose your panels in the Workspace > Show Panel in Workspace drop-down menu.

This function provides the ability to turn on or off a panel by clicking the name of the panel in the UI toolbar at the top of the DaVinci Resolve interface, if you decide you want to hide it to make a little more room.

Show Page Navigation

You can now show and hide the Page Navigation icons at the bottom of the DaVinci Resolve interface to provide the maximum amount of screen real estate for the GUI on smaller monitors.

To toggle the Show Page Navigation function:
- Check Workspace > Show Page Navigation.

With this interface element hidden, you can use keyboard shortcuts to access the individual pages (Shift - 2 through 8), Project manager (Shift - 1) and Project settings (Shift - 9). You can also access these functions from DaVinci Resolve's main menu bar.

Improved Editing of Parameter Values Using Arrow Keys

Manually editing numerical parameter values in DaVinci Resolve has been refined. You can now use the arrow keys to navigate and make adjustments to the decimal level in number fields.

To use the arrow keys to adjust numerical parameters:
1 Double click to select a numeric value in a field, and a highlight appears around that value.

2 Use the left/right arrows to navigate the cursor to the right of the decimal value you want to adjust.

3 Use the up/down arrows to change the value of that decimal place.

4 If you select the entire number, the up/down arrows will adjust the minimum value.
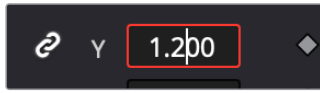
This cursor is in place to adjust the tenths
position using the up and down arrows

Viewer Fast Forward and Rewind Speed Indicators

An indicator showing the speed at which playback is occurring now appears in the Viewer
just to the right of the Loop arrow in the Media, Cut, and Edit pages. This indicator only appears
during a fast forward or rewind operation and shows numeric multiples of real time
playback (x2 x8, x16, x64, etc.).

MacOS Title Bar Integration

DaVinci Resolve 17 has removed the white title bar previously found at the top of the
DaVinci Resolve window in macOS, and integrated its window management features into the
main GUI. This gives you more space to work with on smaller resolution monitors. The Close,
Minimize, and Zoom options are still found in their accustomed position at the upper-left corner
of the UI, but even these can be removed by selecting Workspace > Full Screen Window, for
the maximum amount of screen real estate possible.

New Preferences and Project Settings

DaVinci Resolve 17 has added several new settings and preferences to customize your
hardware and the properties of the toolset.

Assign Capture and Playback to Separate Devices

If you have more than one Blackmagic Design video device connected to your computer,
you can now independently configure them for playback and capture. You can change the
setup of your devices in the Video and Audio I/O section of the System tab of the
DaVinci Resolve Preferences.

- **For playback use:** Select your Blackmagic device for video output from
  DaVinci Resolve. The default is "None," and any changes to this setting require a
  restart of the program.

- **For capture use:** Select your Blackmagic device for video input to DaVinci Resolve.
  The default is "None," and any changes to this setting require a restart of the program.
  This selected device is also used for Resolve Live.

New Resize Filter Options

DaVinci Resolve 17 now lets you take control of the exact algorithm used in all resizing
operations. The new Resize Filter options available are: Bessel, Box, Catmul-Rom, Cubic,
Gaussian, Lanczos, Mitchell, Nearest Neighbor, Quadratic, and Sinc. These options can be set
in the Image Scaling section of the Project Settings, by setting Resize Filter to "Custom"
and choosing the exact filter from the drop-down menu. These new filters are also available in
the "Resize Filter" drop-down menu in the Retime and Scaling section of the Video tab of
the inspector.

In practice, the difference between these methods can be quite subjective. However, if you need to match a specific resizing method used from another application, you can do it here. For everyday use, the normal resizing filters in DaVinci Resolve should be sufficient. These include: Smoother, Bicubic, Bilinear, and Sharper as described in the DaVinci Resolve Reference Manual.

Ability to Enable and Disable Open FX Plug-ins on Startup

You can now selectively enable and disable specific Open FX plug-ins on startup. You can use this function to streamline and organize the Open FX list to just the plug-ins you commonly use, or to exclude a problematic plug-in that causes instability in the system. Additionally, DaVinci Resolve automatically checks the last plug-in loading result on startup, and skips any plug-ins that previously caused a crash or hang.

Individual Open FX plug-ins can be manually Enabled and Disabled in the Video Plugins panel in the System tab of the DaVinci Resolve Preferences.
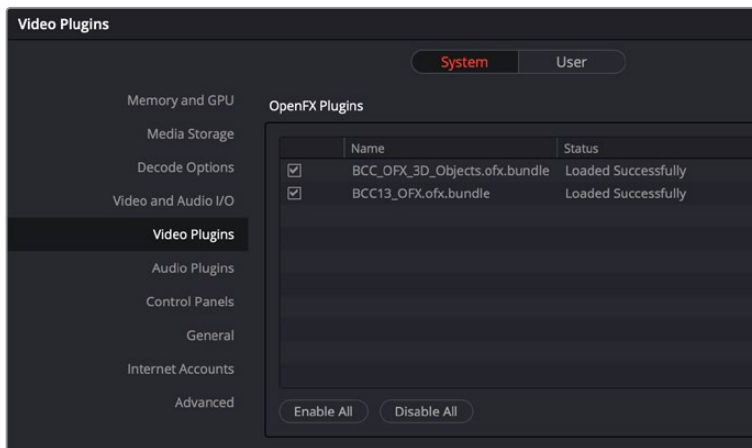
The Video Plugins panel allows you to enable or disable specific Open FX plug-ins at startup

Pro Tools Keyboard Customization

If you are coming to DaVinci Resolve as an experienced Pro Tools user, you can set up your keyboard shortcuts to mimic the Pro Tools layout by selecting "Pro Tools" in DaVinci Resolve > Keyboard Customization (option-command-K) window.

Timeline Sort Order Setting

A new user setting allows you to determine the default sort order of the Timelines that appear in the Viewer drop-down menus throughout DaVinci Resolve. To change this, open the UI Settings panel of the User tab in the DaVinci Resolve Preferences, and choose an option from the Timeline Sort Order drop-down menu.

- **Alphabetic:** Sorts Timelines alphabetically A-Z.
- **Creation Date:** Sorts Timelines by oldest creation date first.
- **Recently Used (default):** Sorts Timelines by the last actively used Timeline first.

Thai (ภาษาไทย) and Vietnamese (Tiếng Việt) Language Localization

Now the Thai (ภาษาไทย) and Vietnamese (Tiếng Việt) languages are supported in DaVinci Resolve's interface. "ยินดีต้อนรับ" and "chúc may mắn" to our Thai and Vietnamese users!

To change DaVinci Resolve's interface language choose from the "Language" drop-down menu in the UI Settings section of the User tab in the DaVinci Resolve Preferences.

Performance and Cache Improvements

DaVinci Resolve 17 also boasts some impressive performance and caching improvements.

Improved Playback Performance in the Color Page

Color Page playback performance across the board has been enhanced in DaVinci Resolve 17. It should be most noticeable in marginal playback situations, for users who were previously only getting 22-23 fps in a 24 fps timeline.

Adjustment Clips Rendered to Cache

Adjustment clips can now be rendered to the Cache in Smart and User modes in the same manner as normal video clips. For more information on using the various cache modes, see Chapter 6 "Improving Performance, Proxies, and the Render Cache" in the DaVinci Resolve Reference Manual.

Sharing Optimized Media Between Projects

Optimized Media is now shared across projects in the same database (previously optimized media was confined to a single project). This means that if you create optimized media for a clip in one project, that same optimized media will be used for that clip in any other project that's in the same database. This happens automatically, and requires no user input. This will cut down the space requirements for working with the same media across different projects dramatically.

This database-wide functionality has changed somewhat how Optimized Media is now managed. Deleting optimized media from DaVinci Resolve now must take place manually, by removing the files in the CacheClip/Optimized Media folder in your OS. There is also currently no way to show which files in your project have been optimized and which have not.

Collaborative Workflow Improvements

DaVinci Resolve 17 has introduced significant performance gains in its Collaborative Workflow. You should see dramatically increased speeds in navigating bins, as well as the loading and saving projects and timelines. This increased speed should be particularly noticeable with larger projects.

Additionally, connecting to a remote database server and using other collaborative workflow features is no longer exclusive to the Studio version of DaVinci Resolve and is now available to all DaVinci Resolve users. These features are no longer restricted to the Studio version of DaVinci Resolve.

New Proxy Media Workflow

DaVinci Resolve 17 introduces a new Proxy Media workflow to provide a playback optimization option that makes it easier to exchange projects online, work on projects remotely, and work with external media asset management systems. It creates a simple and flexible system for editing collaboration that can be custom configured to your specific requirements.

Creating and Using Proxy Media

Proxy Media is essentially more highly compressed (and potentially lower resolution) versions of your source media that are linked to your source media in DaVinci Resolve via metadata. This is done in such a way as to make it easy to switch back and forth between the original and proxy media as your needs require.

Typically, this lets you use lower bandwidth proxy media for increased real-time effects performance and full speed playback while editing, while easily reverting back to more bandwidth and processor-intensive source media for color correction, finishing, and final output. In addition to enabling better performance, these proxy files are fully portable, which lets you move your whole project easily from workstation to workstation, and even across the internet, accompanied by much more compact proxy media.

You set the resolution and format of your proxies in the Optimized Media and Render Cache section of the Master Settings panel in the Project Settings. There are two settings that control the actual media files created by the Generate Proxy Media command.

- **Proxy Media Resolution:** Choose "Original" to keep proxies the same resolution as the source media. If you prefer, reduce the resolution of the proxy media files by choosing Half, Quarter, Eighth, or Sixteenth to save bandwidth. The "Choose Automatically" option balances visual quality with efficiency by only reducing the resolution of media files that are larger than the currently selected Timeline resolution, using whatever reduction ratio best matches the Timeline resolution.

- **Proxy Media Format:** Lets you choose the specific QuickTime format and codec that the proxy files will be created with. There are several ProRes and DNxHR varieties to chose from, as well as H.264 and H.265 options. Which format you chose will be determined by the bandwidth and quality tradeoffs that you need for a particular project. For example, if you simply want better playback speed from RAW media while preserving image quality, you may want to pick a high-quality codec like ProRes 422 HQ, or DNxHR HQX. If your goal is to send your media across the internet to another editor, you may want to chose a more compressed format, such as ProRes Proxy, or even H.264 or H.265, to keep file sizes small.
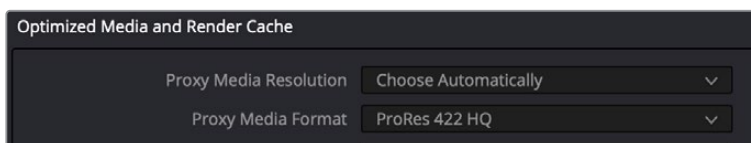
The Proxy Media Resolution and Format settings

To generate proxy media in DaVinci Resolve:

1   Select all of the clips you wish to generate proxies for in the Media Pool.

2   Right-Click any selected clip and choose "Generate Proxy Media" from the contextual menu.

DaVinci Resolve will display a progress bar and give you a time estimate for completion as it renders out your selected clips to the format and codec determined by the Proxy Media Resolution and Format settings.

> **NOTE:** If your source clip has a separate audio file synced to it in the Media Pool, any proxies generated from that clip will include the synced audio, but that audio will be embedded in the video clip instead of being created as a separate file.

Where is Proxy Media Saved?

Proxy media is created in the "Proxy generation location" destination, found in the Working Folders section of the Master Settings of the Project Settings. The proxies are further organized into subfolders by original source clip location. It is important to have enough free space on this drive to contain the proxies. Once created, these proxy files can then be moved to any other drive location on the system, if you wish, and then re-linked to their source files.

Generating Proxy Media in Other Applications

Proxy files can also be generated in applications outside of DaVinci Resolve, such as other NLEs or various media asset management systems. To properly link the proxy to its source media in DaVinci Resolve, the proxy file must meet the following criteria:

- Proxy files must have identical timecode to the source file.
- Proxy files must have the same file name as the source file (excluding extensions).
- Proxy files must have the same frame rate as the source file.
- The format and codec used for proxy files must be supported in DaVinci Resolve.

If your proxy file meets these criteria, you'll be able to manually link proxy media created in other applications to source clips in the Media Pool as described below.

Managing Proxy Media

You can check the status and location of all your proxy media in the List view of the Media Pool. Right-click on any column heading and click the checkboxes of "Proxy" and "Proxy Media Path."

- **Proxy:** This column shows the current proxy status.
    - **None:** Indicates no proxy media has been created.
    - **Offline:** Indicates a proxy has been created but can not be found in the Proxy Media path.
    - **(Resolution):** A number indicating the resolution of the created proxy and that it is online.
- **Proxy Media Path:** The location of where DaVinci Resolve is looking for the proxy file. If this location is incorrect, you can relink the proxy to a new path manually.
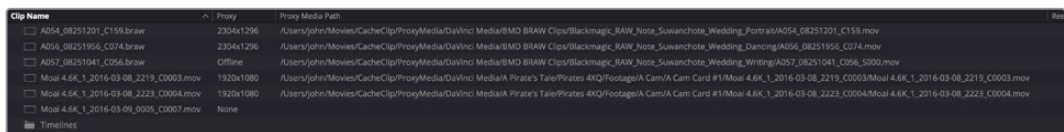
The proxy columns in List view, showing Proxy Media status and location

Linking Clips to Proxy Media

If you've created proxy media in another application, or moved the internally created proxy media out of its default location in "ProxyMedia," you'll need to manually link the proxies to their source media files in your Media Pool.

To link proxy media to a source clip:

1   Select one or more clips in the Media Pool you wish to link proxy media to.

2   Right-click one of the selected clips, and choose "Link Proxy Media" from the contextual menu.

3   Use the file browser to find the specific proxy file or directory (in the case of multiple clips) to set a new Proxy Media path, and click Open. If you select an incorrect file or directory, a warning dialog box will appear and no linking will occur.

To unlink proxy media from a source clip:

1   Select a clip or clips in the Media Pool you wish to unlink proxy media from.

2   Right-click on any clip and select "Unlink Proxy Media" from the contextual menu. This will remove the metadata link from proxy to source and will set the status in the Proxy column to "None."

> **NOTE:** Unlinking a proxy file does not delete it. The proxy file remains on the hard drive where it was created. As of this writing, proxy files must be deleted manually using your OS file system outside of DaVinci Resolve.

Re-generating Proxy Media

You can generate more than one proxy file per clip. This can be useful if you want to set multiple Camera Raw parameters and choose between them, or to create proxy files of different resolutions.

To generate a new proxy:

1   Make your desired changes to the current clip's settings.

2   Right-click on the same clip and select "Generate Proxy Media" from the contextual menu.

A new proxy file is created in the same directory as the previously linked proxy file, and its file name is appended with "_s00x" to differentiate it. The latest proxy generated is automatically linked to the source file, but previous proxy versions are retained on disk, so you can then manually relink the different versions as needed.

Switching Between Proxy Media and Source Media

You can switch between using your original source media and the proxy media for playback at any time by checking or unchecking Playback > Use Proxy Media If Available in the Menu bar.

Using Proxy Files for Delivery

By default, the Deliver page always reverts proxies to the original source media for final output to ensure the highest quality render. Checking the "Use proxy media" box in the Advanced Settings of the Video Render settings in the Deliver page overrides this so DaVinci Resolve uses proxy media for final output instead. This can be useful if you need to save rendering time while making dailies, or to quickly create outputs of your timeline for producers or audio engineers where master quality is not necessarily needed. You will also need to check the "Use proxy media" box if you are editing with proxies and do not have access to the original source media.

Moving Proxies Using a DaVinci Resolve Archive (.dra)

When moving proxies from one DaVinci Resolve system to another, it can be time consuming and problematic to manually copy many individual assets (proxies, graphics, source files, etc.) from different folders and locations. By far the easiest way to move complete projects system to system is by letting DaVinci Resolve do all that file management for you, by creating a DaVinci Resolve Archive (.dra). An archive file contains not only your project, but all its media as well, maintaining the file paths and organization of the original project.

To create a DaVinci Resolve Archive file, right-click on any project in the Project Manager, and choose "Export Project Archive" from the drop-down menu. Within this mechanism, a new Archive setting in DaVinci Resolve 17 makes working with proxies simple and elegant.

Creating a Proxy-Only Archive to Share

In the Archive Options dialog, if you check Proxy Media, and uncheck Media Files and Render Cache, DaVinci Resolve will make an Archive using only the proxy media. This allows you to create a compact and easily transported version of your project to either move to another computer, or to give to an editor working remotely. If proxy media is not available for a clip (say a graphic or a media file you didn't create a proxy for in the first place), the original media is automatically exported to ensure that nothing goes offline.
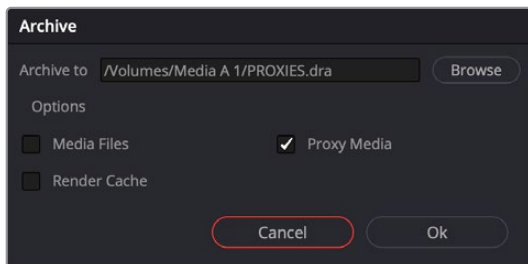
Archive Setting options for exporting only Proxy Media

The resulting .dra is a folder that is a fully self-contained version of your project and proxy media. This folder can easily be moved from drive to drive, or zipped up and sent across the internet.

Working Remotely Using Proxy Media

The proxy workflow in DaVinci Resolve opens up many new possibilities for editing collaboration and media management. For example, one common workflow is to use the RAW camera master source clips in the editing suite, but to then generate low resolution proxies to take home to edit on a laptop.

To create a portable set of proxies for editing on a laptop:

1. Set up the Resolution and Format settings for the proxies in the Project Settings. In this case, you may want to use "Choose Automatically" and a low- bandwidth, easily editable codec like ProRes LT or DNxHR LB.

2. Select all source media in the Media Pool and Generate Proxy.

3. Export a DaVinci Resolve Archive (.dra) onto an external drive, with only Proxy Media checked.

4. Go away. Once at home, connect that drive to your home laptop, and use the Restore Project Archive command in the Project Manager to import the archive.

5. When you've finished working at home, export a timeline, bin, or project from your laptop when finished, and bring just that file back into the edit suite to continue working with the original source media.

Another common scenario might involve sending proxies over the internet to an editor in another city or country.

To send a project to another editor over the internet:

1. Set up the Resolution and Format settings for the proxies in the Project Settings. In this case, you may want to use a low resolution like "quarter" or "one-eighth," and a low-bandwidth, highly-compressed codec like H.265 for the smallest file sizes possible.

2. Select all of the source media in the Media Pool and Generate Proxy.

3. Export a DaVinci Resolve Archive (.dra), with only Proxy Media checked.

4. Using the file compression tools in your OS, zip the archive folder so it becomes one large file.

5. Upload the resulting .zip to the online file sharing service you prefer, and send the download link to the remote editor.

6. Once the other editor unzips and imports the archive, you and they can then simply send timelines, bins, and/or project files back and forth to collaborate. These files are small enough to transfer over email or an instant messaging service.

Additionally, you may have your editing computer connected via ethernet to a Media Asset Management system that can create its own proxies. In order to edit smoothly via the network, you need to use low bandwidth proxies instead of the source media.

To create proxy media externally to edit over a local network:

1. Import the original source media files to your Media Pool from the network storage system you're using.

2. Set up the proxy generation settings in your Media Asset Management software to accommodate the amount of network bandwidth you expect to have access to.

3. Make sure the timecode and frame rate of the proxies match the original source media, and render the proxies to a network location.

4. Select all of your original source media in the Media Pool, and choose "Link Proxy Media."

5. Choose the proxy media at the network location where they've been rendered.

Proxy Media vs. Other Playback Optimizations in DaVinci Resolve

There continue to be other methods of optimizing real time performance in DaVinci Resolve, so it's natural that one might wonder how this is different from Optimized media, Timeline Proxy Mode, and other performance optimization techniques available in DaVinci Resolve. The key aspect of proxy media that differentiates it is that proxy media is independent, portable, and can be created by applications outside of DaVinci Resolve, if desired.

Proxy Media vs. Timeline Proxy Mode

One of the oldest performance optimization options, originally named "Proxy Mode" in previous versions of DaVinci Resolve, has been renamed "Timeline Proxy Mode" in DaVinci Resolve 17 to differentiate it from Proxy Media. While the new Proxy Media feature creates actual media files on disk, "Timeline Proxy Mode" simply reduces the resolution of the timeline on the fly, allowing for increased real time playback performance. To be clear, Proxy Media and Timeline Proxy Mode are two entirely different features, which are wholly independent of one another.

Proxy Media vs. the Render Cache

Proxy Media is designed to create easy-to-edit primary source material on the Timeline, for improved performance before you start editing. The Render Cache is designed to improve the real time performance of clips that have enough computationally intensive effects (such as Resolve FX, color corrections, noise reduction, compound clips, fusion compositions, etc.) to slow playback, even at the current Timeline resolution. Proxy Media is independent and portable (you can move clips wherever you want; you just have to relink them afterward), while the Render Cache media is not designed to be moved or interacted with externally and only works with the project it was made for.

Proxy Media vs. Optimized Media

On the surface, Proxy Media and Optimized Media appear similar in function. Both options are designed to create lower bandwidth, easier to edit versions of source media. However, Optimized Media is managed internally by DaVinci Resolve, cannot be exported, and is not user accessible. In contrast, Proxy Media creates fully portable and independent media that can be easily managed by the user.

The chapter in the DaVinci Resolve Reference Manual titled "Improving Performance, Proxies and the Render Cache" goes into detail on when and how to use DaVinci Resolve's various playback optimizations modes, but included below is a quick reference.

- **Timeline Proxy Mode:** My timeline is playing back, just a little bit too slowly.
- **Cache Clip:** I need help playing back a few clips in real time that have heavy effects applied.
- **Optimized Media:** I need help playing back all my source media in real time, and I will only be editing on this computer.
- **Proxy Media:** I need help playing back all my source media in real time, and I need to collaborate and share media with other users, programs, or outside storage locations.

Improved Media Handling

This release of DaVinci Resolve has greatly improved the media handling of interlaced material.

Improved Processing of Interlaced Material

The processing and output of interlaced media has been significantly improved in DaVinci Resolve 17, with better support for processing interlaced timelines natively. Video clips brought into DaVinci Resolve will automatically be tagged as progressive, upper, or lower field interlaced. This new native interlace processing will allow for much better compositing and title support for those making interlaced deliverables.

To set up native interlaced processing:

1   Select your Timeline Format in the Master Settings section of the Project Settings window.

2   Turn on the Enable Interlace processing checkbox.

3   Notice that your Timeline frame rate has changed to an interlaced fields per second specification (50, 59.94, 60). Select the correct interlaced format from the drop-down menu.

4   Choose an interlaced Video format in the Video Monitoring section of the Project Settings, to output a native interlaced signal using a Blackmagic video monitoring device.

DaVinci Neural Engine Deinterlacing (Studio Only)

There is a new deinterlacing quality option in addition to "normal" and "high," called DaVinci Neural Engine. As the name suggests, this option uses the advanced machine learning algorithms of the DaVinci Neural Engine to analyze motion between the fields of interlaced material and reconstructs them into a single frame. This option is computationally intensive, but ideally will deliver an even more aesthetically pleasing result than the "high" setting.

To choose this deinterlacing mode, use the "Deinterlace quality" drop-down menu of the Image Scaling panel of the Project Preferences, and choose DaVinci Neural Engine. Deinterlacing is automatically applied to any interlaced video material that is placed in a progressive timeline.

Real-Time 3:2 Pulldown Removal

If you have 29.97fps interlaced material that was encoded with a 3:2 pulldown, DaVinci Resolve can reconstruct the original footage's progressive frame rate in real time. For example, if you have source media from a film camera (24fps progressive) that has been telecined to NTSC video (29.97fps interlaced), DaVinci Resolve can pull the original 24 discrete film frames out of the various interlaced fields that make up the NTSC signal.

To remove 3:2 pulldown in real-time:

1   Select one or more 29.97 fps interlaced clips in the Media Pool.

2   Right-click one of the selected clips and select Clip Attributes.

3   In the Video tab, turn on the Remove 3:2 Pulldown checkbox.

4   Set the Frame where the 3:2 cadence started in the "First Frame of Clip" drop-down (this is usually the "A" frame).

5   Click OK.

The footage will now behave like a 24fps progressive clip.

Telecine footage with 3:2 pulldown removed; the scrambled number (mix of the numbers 1 and 2) at the end of the KeyKode is a field indicator, showing that this A frame was created properly from fields 1 and 2 of the interlaced signal

Improved Format Support

As the production industry evolves, so too does DaVinci Resolve's support for new and improved media formats. Version 17 introduces many new developments.

New Decoding support
- Support for decoding QuickTime PNG clips
- Support for decoding uncompressed RGB 8-bit and YUV 10-bit AVI clips
- Support for decoding spanned Panasonic 8K SHV clips
- Support for decoding 32-bit PSD format images
- Support for Canon and Nikon raw formats on the inspector

New Decoding/Encoding and Media Management support
- Support for 12K Blackmagic RAW clips
- Dolby Vision functionality is now available on Windows systems
- Support for reading per frame metadata from Blackmagic RAW, ARRI, RED, and Sony camera files
- Improved support for exporting per-frame ARRI metadata for ARI/ARX/MXF formats
- Support for decoding and rendering per-frame EXR metadata
- Improved metadata support for Sony MXF clips
- Support for decoding and encoding GoPro CineForm clips for non-multiple of 16 resolutions
- Support for decoding and encoding mp3 audio in Linux
- Support for decoding and encoding high-throughput JPEG 2000 (HTJ2K)
- Ability to bypass re-encodes for supported JPEG 2000 profiles on renders
- Support for encoding IMF MCA audio metadata
- Support for exporting non-HDR DCP metadata option
- Support for HDR tags in DCP workflows
- Support for a 16-bit SDR IMF preset
- Support for Photon 4.8.0 for IMF validation
- Support for decoding and encoding H.265 clips with alpha on macOS
- Native support for 44.1 KHz sample rate audio clips and instruments
- Support for IMF supplemental packages with Dolby Atmos content
- Support for importing AES31 timelines

New GPU support
- Support for additional NVIDIA encoder parameters for H.264 and H.265
- Support for NVIDIA Ampere GPUs on Linux and Windows systems

New Internet Account support
- Support for directly uploading to Twitter from DaVinci Resolve

Media Pool Improvements

DaVinci Resolve 17 has improved its core media pool functionality and increased the options for sharing assets between workstations.

Support for Viewing and Adjusting Media Pool Clips in Inspector

You can now directly modify Media Pool clips in the Inspector, before you edit those clips into a timeline. This allows you to change the parameters of source media so that clips that are edited into a timeline carry those new settings with it. For example, you can prepare your material prior to editing by changing the clip's file and RAW settings, adjusting the audio levels and EQ, or assigning it a specific lens correction, etc. Once modified, any part of that clip would have the correct Inspector parameters already in place when you edited them into your timeline.

To adjust Media Pool clips in the Inspector:
1   Select one or more clips in the Media Pool Panel of either the Cut, Edit, or Fairlight pages.
2   Open the Inspector panel, and adjust any parameters in the Video, Sizing, Audio, and File tabs.

These parameter changes are stored with the Media Pool clip, and will be carried over when any part of that clip is edited into the Timeline. Of course, each clip's Inspector parameters can be further modified once it's in the Timeline, and those Timeline parameters are independent from the Media Pool Inspector settings. This means that any further adjustments you make to the clip in the Timeline do not affect that same clip's adjustments in the Media Pool.

Import and Export Specific DaVinci Resolve Project Bins

You can now import/export specific bins from one DaVinci Resolve project to another, allowing you to pass bins quickly between projects and workstations that have access to the same media. All Metadata, In/Out points, Timelines, etc. are transferred along with the clips in the bin, but none of the actual media files are included.

To export bins from the Media Pool:
1   Select one or more bins in the Media Pool.
2   Right-click the selection and choose "Export Bin," or choose File > Export > Export Bin.
3   Choose where to save the DaVinci Resolve Bin file (.drb) in the file system dialog, and click Save.

To import bins into the Media Pool:

1 Right-click in the Media Pool and choose "Import Bin," or choose File > Import > Import Bin.

2 Do one of the following:

 – Choose a DaVinci Resolve Bin file (.drb) from the file system dialog.

 – Double click the .drb file in your file system.

The bin or bins will appear in the Media Pool. Any bins imported this way will have the word "import" appended to their name, to avoid duplicate names. If you import a bin that contains clips that were already in the Media Pool, the potentially duplicate clips are excluded from the import and instead relinked to the media referenced by your project. This keeps your Media Pool tidy. However, if the bin or bins have been moved to another computer, you may have to relink offline media.

Import and Export Individual DaVinci Resolve Timelines

You can now export and import individual timelines from one DaVinci Resolve project into another previously existing DaVinci Resolve project, allowing you to pass timelines quickly between projects and workstations, without creating additional imported project files. Just the timeline and its associated clip information is exported, none of the actual media files are included.

To export a timeline from the Media Pool:

1 Select a timeline from the Media Pool.

2 Choose File > Export > Export AAF, XML, DRT (Shift-Command-O).

3 Choose "DaVinci Resolve Timeline Files (*.drt)" from the format options popup in the file system dialog.

4 Choose where to save the DaVinci Resolve Timeline file (.drt) in the file system dialog, and click Save.

To import a timeline into the Media Pool:

1 Choose a bin in the Media Pool in which you want the imported timeline to be saved.

2 Do one of the following:

 – Choose File > Import Timeline > Import AAF, XML, DRT (Shift-Command-I), then Select a DaVinci Resolve Timeline file (.drt) from the file system dialog, and click Open.

 – Double click the .drt file in your file system.

The timeline will appear in the Media Pool, along with all of the clips associated with it. Any timelines imported this way will have the word "import" appended to their name, to avoid duplicate names. The imported timeline will be automatically conformed to corresponding media that's already in the Media Pool. However, if the timeline has been moved to another computer, you may have to reimport or relink missing or offline media in to bring the imported timeline fully online.

> **NOTE:** Only a single timeline can be imported and exported at a time using this method. To import or export multiple timelines, use the Import/Export Bin function described above.

Media Management of Timelines Creates DRT Files

When performing Media Management operations to copy or transcode media from a timeline, a DaVinci Resolve Timeline (.drt) file is automatically created in the same bin as the resulting media files, linked to the newly created media.

Disable Timelines

You can now disable/enable timelines in the Media Pool for both performance and organizational purposes. This is particularly useful for editors who like to maintain a history of a program's editing via an ongoing series of periodically duplicated timelines. Since having a large number of timelines within a single project file can affect performance, having the ability to disable timelines lets you maintain these backup/alternate timelines without any penalty.

Disabled timelines are never loaded into RAM, have no effect on the speed at which a project opens, saves, exports, or loads, and have no effect on program performance. A disabled timeline also hides the timeline from the viewer drop-down menus throughout the program. Disabled timelines are still visible in the Media Pool, but have a crossed out eye icon in the lower left to show the status. A disabled timeline cannot be opened in any page of DaVinci Resolve.

To disable a timeline:
 – Select the timeline, right-click on it and choose "Disable Timeline" from the drop-down menu.

To enable a timeline:
 – Select the timeline, right-click on it and choose "Enable Timeline" from the drop-down menu.
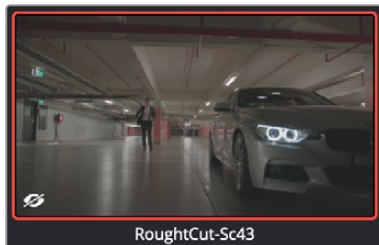
The crossed-out eye in the lower left of the thumbnail indicates this timeline is disabled

New Offline Clip Relinking Icon and Dialog

A new offline clip relinking dialog makes it easier to find specific clips that are missing. If DaVinci Resolve fails to find your media, a Relink icon in the Cut and Edit Media Pools will highlight orange.
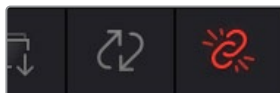
The new Relink Media icon that appears for unlinked media

Clicking this icon opens a new dialog box showing the volumes that the missing files initially belonged to. You can then use this information to track down the media on your file system, find that specific hard drive, or ask a client if they provided you the media from this volume. Clicking the Locate button lets you re-connect the missing clips to a new file location of your choosing.

If the quick search initiated by the Locate buttons doesn't find media that you know is there, you can initialize an exhaustive deep disk search for the media by clicking on the Disk Search button.
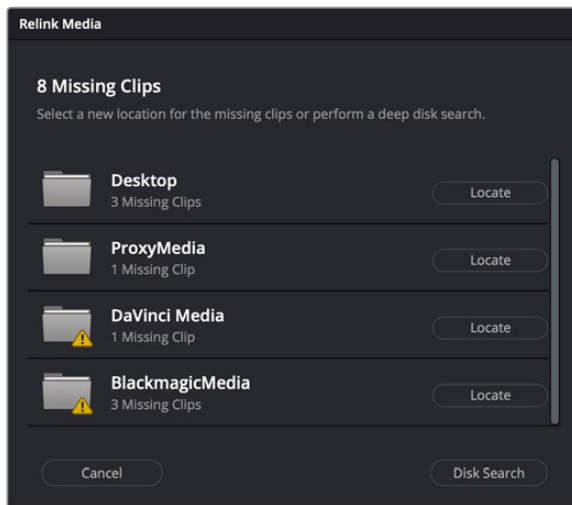
The new Relink Media dialog, showing the volume names where the missing clips originated

Support for Continuing Media Management Jobs on Error

DaVinci Resolve 17 has more user-friendly behavior when dealing with errors during media management operations. In previous versions, DaVinci Resolve would stop and wait for user input immediately upon encountering an error, meaning that if an error happened while you were out at lunch, nothing would happen until you came back. Now, DaVinci Resolve will skip error-flagged files and continue to perform any remaining media management to all the other clips.

Ability to Save Smart Bins and Smart Filters Across Projects

If you have a commonly used Smart Bin or Smart Filter set up, you can now use it across multiple projects in your database.

To set up Smart Bins or Smart Filters across projects:
  – Create a new Smart Bin or Smart Filter, and turn on the "Show in all projects" checkbox in the upper right corner of the Create Smart Bin dialog.

These persistent Smart Bins will be found in the User Smart Bins folder in the Smart Bins pane in every project. Persistent Smart Filters will be found in the User Smart Filters section of the Clips drop-down menu in the Color page.

Support for Growing Files in the Media Pool

If you're using a third-party application that records live to a growing video file, you can now begin to edit that file while it's still recording. Simply import the growing file into the Media Pool, and DaVinci Resolve will continuously refresh to check if the file has changed, automatically updating its attributes in the Media Pool.

To set this option, check the "Automatically refresh growing files in the Media Pool" box in the Decode Options of the System tab in the DaVinci Resolve Preferences.

Chapter 2

Cut Page Improvements

The Cut page in Resolve 17 has been reworked to include optimized design elements and new functionality to create a faster editing experience.

Contents

New Metadata View in Media Pool

Resolve 17 adds a new Metadata view to the Media Pool. Each clip is represented by its own card with a thumbnail and basic clip metadata information visible. This view is designed to have more metadata information than a thumbnail but more targeted information than the List view. This feature, combined with its sort modes, are a powerful way to organize and reorganize your clips in the Media Pool.

The metadata fields of the Metadata view (from the top down):

- **Thumbnail:** A scrubbable thumbnail image of your clip.
- **Row 1:** A main description field that is variable and determined by the sort order selection.
- **Row 2:** Start Timecode, Date Created, Camera #.
- **Row 3:** Scene, Shot, Take.
- **Row 4:** Clip Name, Comment.
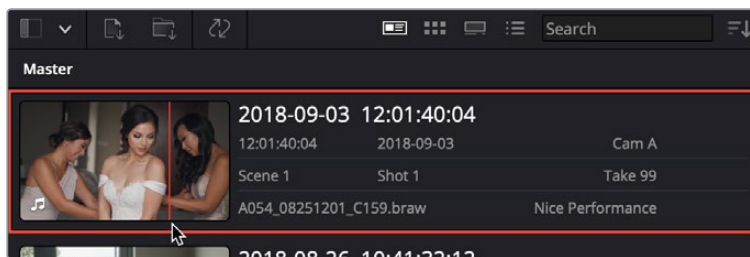
The Metadata View icon view (highlighted icon in the top bar), showing the thumbnail being scrubbed next to the clip's metadata

The strength of the Metadata view is the automatic clustering of your clips based on the sort order you choose in the Media Pool Sort By menu, at the very upper-right corner of the Media Pool. It is also possible to use these sort options in the Thumbnail, List, and Filmstrip views as well.
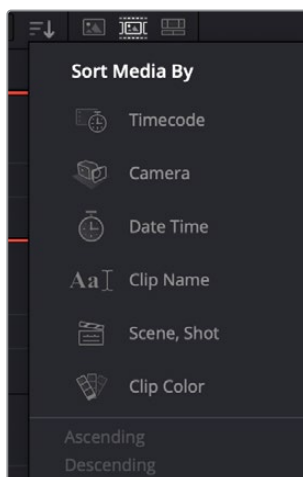
The Media Sort options of the Cut page Media Pool

Each different sort mode changes the main description field on the card, as well as re-arranging the Media Pool to reflect the selected organization method.

The sort modes available in the Metadata view are:

- **TImecode:** This mode clusters the clips by creation date, changes the main description field to creation date and start timecode, and orders the list by timecode.

- **Camera:** This mode clusters the clips by Camera #, changes the main description field to camera # and start timecode, and orders the list by timecode.

- **Date Time:** This mode clusters the clips by day, changes the main description field to creation date and file name, and orders the list by timecode.

- **Clip Name:** This mode clusters the clips by the first letter of the clip name in alphabetical order, changes the main description field to clip name, and orders the list by timecode.

- **Scene, Shot:** This mode clusters the clips by scene, changes the main description field to scene-shot-take, and orders the list by scene-shot-take.

- **Clip Color:** This mode clusters the clips by clip color name, changes the main description field to creation date and start timecode, and orders the list by timecode.

- **Date Modified:** This mode clusters the clips by day, changes the main description field to creation date and file name, and orders the list by the last time the clip was modified by the OS filesystem.

- **Date Imported:** This mode clusters the clips by day, changes the main description field to creation date and file name, and orders the list by the date the clip was added to the Media Pool.

- **Ascending:** Orders the Media Pool from lowest numerical value to highest, and alphabetically from A to Z.

- **Descending:** Orders the Media Pool from highest numerical value to lowest, and alphabetically from Z to A.
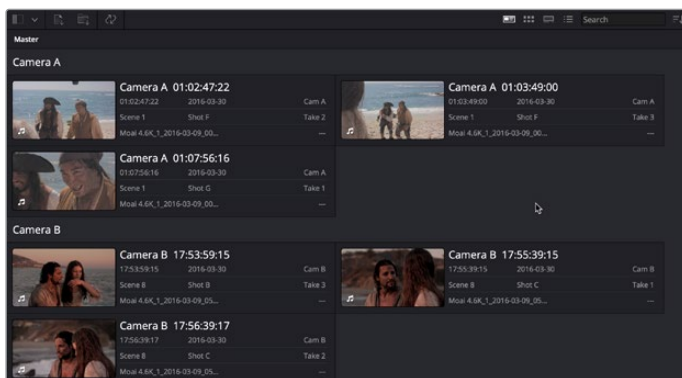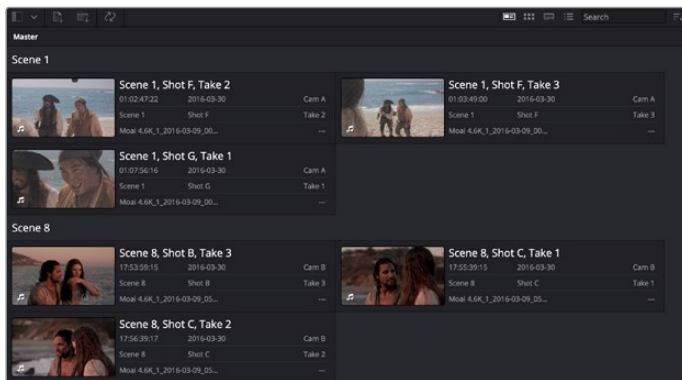
(Top) The Metadata view with clips sorted by Scene-Shot-Take;
(Bottom) The Metadata view with the same clips sorted by Camera

Audio Trim View

When performing a trim operation in the Cut page, you can now set the option to expand the audio waveform of a Timeline clip while trimming. This mode gives a much more accurate view of the audio, making it easier to pick a specific edit point between words, beats, etc.

To toggle Audio Trim view:
- Click the Audio Trim icon, between the Snapping and Marker tools.
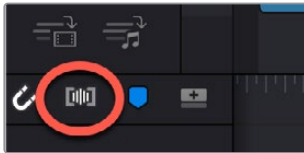
The Audio Trim View icon activated (circled)

With this option enabled, you'll see an expanded waveform for audio/video clips that are being trimmed in the Timeline, while you're trimming. This shrinks back down after you finish the trim operation.
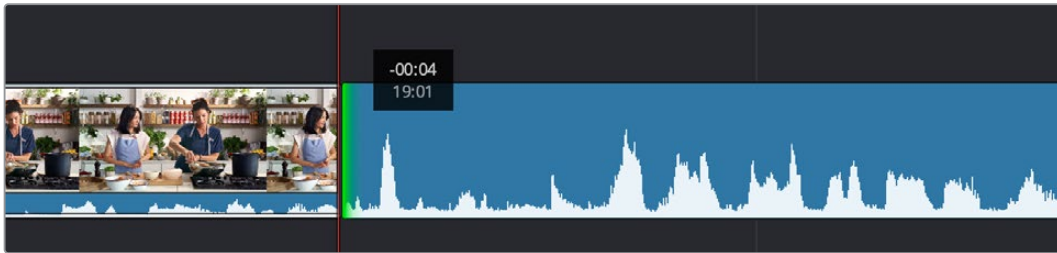
The Audio Trim view showing an expanded audio waveform while trimming in the Timeline

Safe Area Framing Guides

This drop-down menu overlays many useful framing guides over the Viewer to let you see what part of the image will be included and what will part will be cropped out if you change the Timeline's aspect ratio. The framing guides can be turned on and off by toggling the Safe Area Framing Guide icon in the Viewer, and the exact guides can be selected in the drop-down menu.

The aspect ratios available in the Framing Guide drop-down are:
- **Social Media:** 1:1, 4:5, 9:16, 1.91:1, 16:9.
- **Broadcast and Film:** 1.33, 1.66, 1.77, 1.85, 2.35.
- **Safe Area Guides:** These options add additional guide lines on the Viewer to protect your composition from possibly being cut off at the extreme edges of a physical cathode ray tube. While somewhat anachronistic in this age of flat screen digital televisions, many legacy programs still adhere to these guidelines. Safe Areas still can be useful guides in ensuring your image is not inadvertently cropped by the variety of mobile devices and social media sites in use today.
  - **Action:** Keep all movement and important action within this box.
  - **Title:** Keep all on screen text within this box.
  - **Center:** Designates the exact middle of the image.
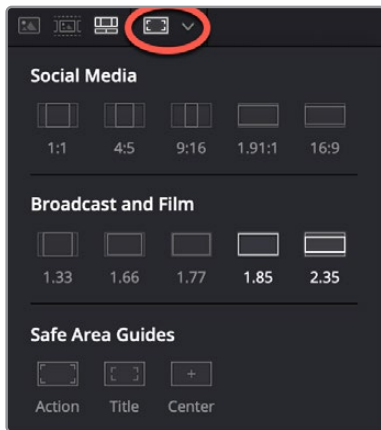
The Safe Area Framing Guide icon
(circled) and the possible framing options

Ability to Import ATEM Mini Pro ISO Projects

It is now possible to import ATEM Mini Pro ISO projects directly into DaVinci Resolve. ATEM projects include the master program clip, as well as each individual camera "ISO" (isolated) clip, and each angle's audio recordings. All transitions, timecode, and camera number metadata are imported, as well as whatever graphics were stored in the ATEM's media pool. Once the project is loaded, the Sync Bin view is enabled in the Cut page, so you can seamlessly continue your multi-camera edit. For more information on using the Cut Page, see Chapter 18 "Introducing the Cut page" in the DaVinci Resolve User Manual.

An ATEM Mini Pro project opened in the Cut page Sync bin

It's also possible to instantly switch your ATEM camera ISOs to the original camera recordings made in a Blackmagic Camera. This workflow enables the highest visual quality, and the ability to output in higher resolutions (such as 4K or UHD) than are supported by the ATEM internally.

To relink to camera masters from ATEM ISO recordings:

1 (Before you shoot) Check the "Record in All Cameras" setting in the ATEM software control.

2 (Before you shoot) Check the "ISO record all inputs" setting in the ATEM software control.

3 At this point, record your show as you normally would.

4 Copy all the resulting camera masters from each camera's memory card to the ATEM project's "Video ISO Files" folder, and then import the project into DaVinci Resolve.

5 Click the "Show Camera Originals" button in the Cut page Viewer to instantly switch between ATEM ISOs and Camera Masters.

The Show Camera Originals button

Sync Bin View in Cinema Viewer

The Sync Bin camera selection can now be viewed full screen in the Cinema Viewer by pressing "P" on your keyboard, allowing you to see a larger, more detailed view of each specific camera. In this full-screen mode, the Sync Bin view controls operate identically to those in the normal Viewer.

Sync Bin Timeline Audio Only Playback

When the "Video Only" mode is activated in the Cut page, audio from the sources in the Sync Bin are now muted, and the audio playback is from the clips in the Timeline only.

Dedicated Timecode Entry Mode

There is now a dedicated timecode entry mode for the Cut page. Previously, you would type numbers on the numeric keypad to enable timecode entry, but this precluded you from using these keys as shortcuts for other functions. Now there are three ways of telling DaVinci Resolve that you want to perform a timecode action, regardless of what the numeric keypad keys are assigned to in the Keyboard Customization preferences.

To activate Timecode Entry mode on the Cut page:

1 Select Playback > Goto > Timecode (=) and enter your timecode value.

2 Press "+" or "-" keys, and enter your timecode value to move the current position forward or backward by that amount.

3 Click on the Timeline Timecode display on the Viewer, and enter your timecode value.

Full Screen Viewer Icon on the Cut Page

The Cut page Viewer has a Full Screen Viewer icon in the upper-right, that can be clicked to enable Full Screen view. Press Escape to return to your normal view mode.
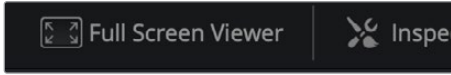
The Full Screen Viewer icon

Quick Export Dialog Options

The Quick Export Dialog in the Cut page has been updated. The interface has been redesigned to incorporate the Twitter preset, as well as more prominently listing the basic info (fps, resolution, etc.) for each preset.
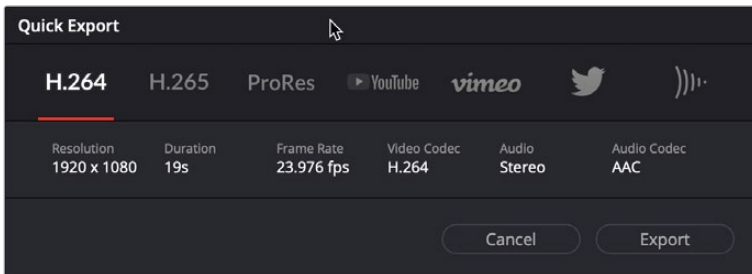
The Quick Export dialog

Navigable Clip Paths in Source Tape

The Media Pool in the Cut page has a navigable title bar that shows a clip's Media Pool hierarchy. You can now navigate up and down this hierarchy in the Source tape. In DaVinci Resolve 17, the Source tape has a flattened view, which shows all clips in both the current bin and any sub-bins it may contain. This is useful when navigating bin structures that reflect the original camera file system. For example, you may have a camera that records each memory card as a separate folder, and then each individual clip is saved as a separate folder inside that folder. When you bring this file system into the Media Pool using the Create Bins option, these nested levels are mirrored in the Media Pool bin structure. Now when you click on a card bin in the Source tape, it will directly show you all the clips on that card, rather than show many individual sub-bins. This view is also viewable in Thumbnail, List, and Filmstrip views.

As you navigate in the Source tape, the current clip is highlighted, and its hierarchy will now appear in top of the Media Pool title bar. By clicking directly on bins in this bin path, you can quickly broaden or narrow the scope of the Source tape, say from Shoot Day to Camera to Card to Clip and vice versa.
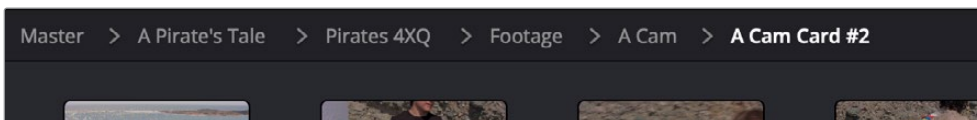
The Media Pool title bar showing a clip's Media Pool hierarchy. Clicking directly on these bins will narrow or broaden the scope of the clips in the Source tape

New Change Clip Duration Dialog

The new Change Clip Duration dialog in DaVinci Resolve 17 allows you to directly change the duration of a clip by typing in frames, a timecode value, or using time and frame-based presets. You can activate the Change Clip Duration dialog by selecting one or more clips on the Timeline and choosing Clip > Change Clip Duration (Command-D), or by right-clicking on a clip and choosing Change Clip Duration from the contextual menu. The Change Clip Duration dialog works both on the Cut and Edit pages.
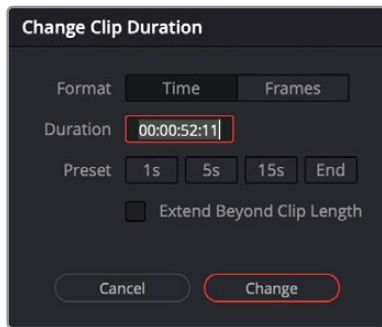
The new Change Clip Duration
box in Timecode mode.

Options for the Change Clip Duration Dialog box:

- **Format:** You can chose between working with TIme (Timecode) or Frame values.
- **Duration:** Type in the timecode value or number of frames you wish to make the new duration of the selected clip.
- **Preset:** Select a duration by clicking on 1, 5, or 15 seconds (or their equivalent value in frames). End will extend the duration to the last frame of the selected clip, regardless of any Out points set.
- **Extend Beyond Clip Length (Cut page Only):** This will append black filler to any clip whose duration is set longer than the clip itself.
- **Cancel/Change:** Click Cancel to exit without changing the duration of the clip, or Change to apply the duration change to the selected clip.

> **TIP:** You can change the duration for more than one clip at a time by selecting multiple clips before opening Change Clip Duration. All clips selected will be the changed to the same duration set in the Change Clip Duration dialog box.

Editing the Duration Field
in the Cut Viewer

When editing using Source tape in the Cut page, you set In and Out points to insert a specified range of video. The duration of that video range appears in the Duration field, which is in the upper-right corner of the Viewer.

This field is now editable, and updates the Out point to match the value you enter. You can directly enter a certain number of frames, use the + or - modifiers to change the value by that exact amount, or make adjustments to the hh:mm:ss:ff field directly.

Switching Timelines in the Cut Page

You can switch from working on one timeline to another by using the drop-down list at the top of the Cut page Viewer. This change unifies Viewer behavior across the Cut, Edit, Color, and Deliver pages.
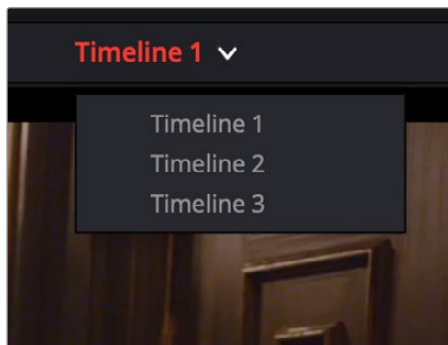
The Timeline Selection drop-down at the top of the Cut page Viewer

Navigating Edit Points and Markers

You can now use the navigation tools Playback > Previous / Next > Clip (Up Arrow / Down Arrow) or Marker (Shift - Up Arrow / Shift - Down Arrow) in the Cut page Timeline. This new feature now unifies Clip and Marker navigation shortcuts between the Cut and Edit pages.

Improved Transition and Effect Behaviors

You can now double click a transition in the Cut page's Transitions panel to apply it directly to the edit point referenced by the Smart Indicator. Double-clicking an effect in the Effects panel applies it directly to the topmost clip at the position of the playhead.

Chapter 3

Using the DaVinci Resolve Speed Editor

The DaVinci Resolve Speed Editor is an edit controller designed specifically to work hand-in-hand with the Cut page.

Contents

Introducing the DaVinci Resolve Speed Editor

The DaVinci Resolve Speed Editor is specifically designed for custom integration with the Cut page. It efficiently combines transport control, editing functions, and multi-camera support into a powerful edit controller with a small footprint.

The DaVinci Resolve Speed Editor

Using the Speed Editor Keys

To maximize the functionality of all the keys on this reduced-sized edit controller, there are four different finger actions used to modify a key's commands:

- **Press:** A short tap to the key and release, as if you were typing.
- **Double Press:** Two short taps to the key and release. The double press triggers the secondary function of the key that is written on the lower side of the keycap.
- **Press and Hold:** Tap the key and hold it down.
- **Double Press and Hold:** One short tap, and then tap again and hold the key down.

Navigation Using the Search Dial

The most prominent feature of the DaVinci Resolve Speed Editor is the large Search Dial on its right hand side. Primarily used for navigation, in certain circumstances this dial can also be used for parameter selection and the direct manipulation of the clips, providing an alternative to click and drag mouse input.

The Search Dial and Navigation buttons
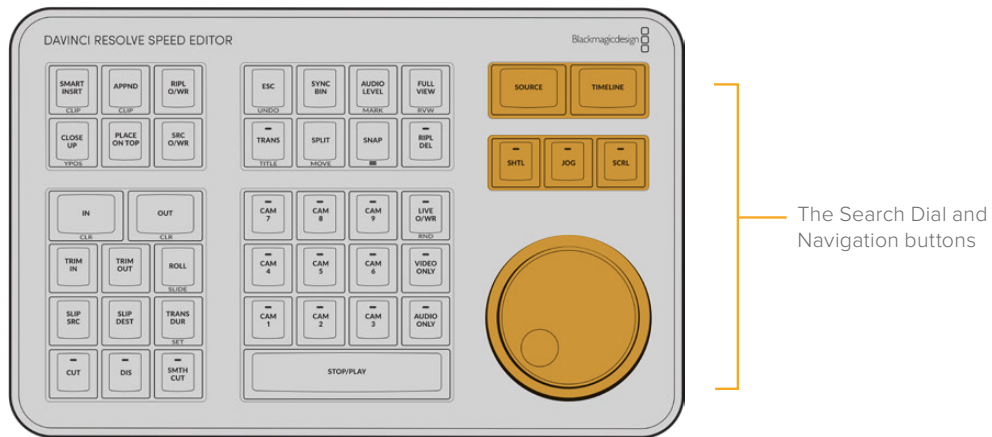
Since navigation of the Timeline is where most editors spend the majority of their time, you will want to decide on how the playhead reacts on the Timeline. In the Cut page you have two options: Lock or Free Playhead.

- When set to Locked, the playhead is fixed in the center of the Timeline, and your edited clips scroll past it as you play (press the Spacebar), jog, or shuttle with the Search Dial in either direction. Locked mode is preferred while using the DaVinci Resolve Speed Editor.

- When set to Free, the playhead moves across the clips as you play (press the Stop/Play bar), jog, or shuttle using the Search Dial in either direction; the clips stay still. Once the playhead gets to the right or left edge of the Timeline, the Timeline pages over to reveal the next part of your edit.
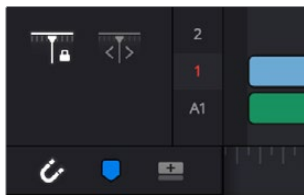
Playhead Lock controls

SOURCE

Pressing this key instantly brings the Source Tape into focus, allowing you to navigate through all the source media in your bin.

TIMELINE

Pressing this key instantly brings the Timeline Viewer into focus, allowing you to navigate through the Timeline.

SHTL (Shuttle)

Puts the Search Dial into Shuttle mode. Used to quickly navigate long clips or sync bins. Rotating the dial left of center "rewinds" through the clip or timeline, rotating it right "fast forwards" through them. The greater the rotation from center, the faster the Shuttle goes. A LED on the keyboard will illuminate to show you that this mode is selected.

JOG

Puts the search dial into Jog mode. Used to navigate to specific frames with accuracy and precision. Traditionally, you place your finger the the search dial dimple, and rotate it to the left to go frame-by-frame reverse, and to the right to go frame-by-frame forward. The faster you rotate the search dial, the faster the navigation. A LED on the keyboard will illuminate to show you that this mode is selected.

SCRL (Scroll)

Puts the search dial into Scroll mode. Scroll mode is essentially a "higher geared" Jog mode. Rotating the wheel left reverses the play direction, while rotating it right moves forward. Scroll works in terms of seconds, rather than frames. The speed at which you rotate the search dial determines how fast the playhead moves through the footage. A LED on the keyboard will illuminate to show you that this mode is selected.

> **TIP:** As a rule of thumb, Shuttle is most effective at the scene level, Jog the clip level, and Scroll at the timeline level.

Intelligent Keyboard Edit Modes

The DaVinci Resolve Speed Editor has dedicated keys to perform common editing functions.

The Cut page Editing tools
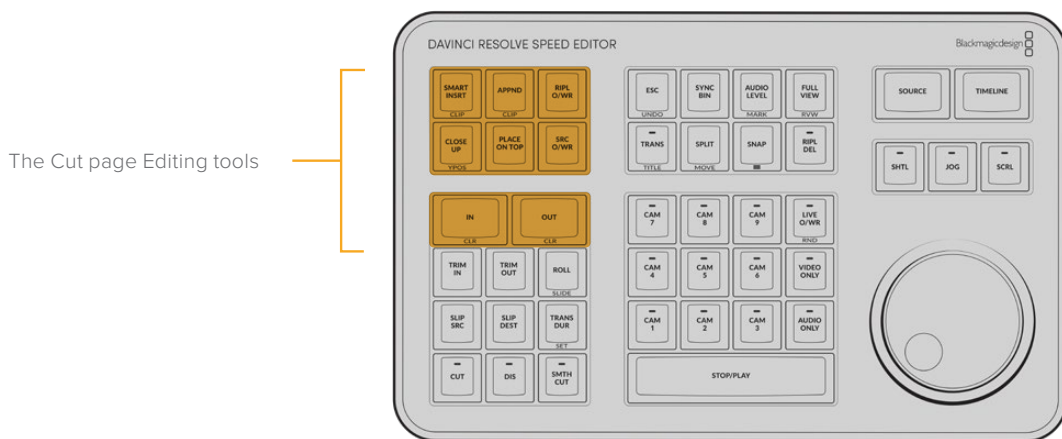
IN / CLR

This key selects the In Point of a clip or timeline. Double press this key (CLR) to clear the In point.

OUT / CLR

This key selects the Out point of a clip or timeline. Double press this key (CLR) to clear the Out point.

If you are viewing a bin in the Source tape, you can use the In and Out buttons to limit the Source tape between the two points. This allows you to quickly reduce the Source tape to a specific section, regardless of how many clips are in your bin.

To reduce the Source tape based on In and Out points:

1   In the Source tape, set the newly desired duration using the In and Out keys on the Speed Editor.

2   Press the "Source" key.

3   The Source tape is now limited to the duration between the two points.

4   If you wish top return to the original full Source tape, press the "Esc" key.

SMART INSRT (Smart Insert) / CLIP

Automatically inserts an incoming clip at the closest edit point to the playhead (as shown by the Smart Indicator) on the selected track, pushing all clips to the right of the edit point forward to make room for the incoming clip you've inserted to Track 1. Because this is a smart operation, you are prevented from inserting a clip at any arbitrary frame; incoming clips are only inserted at the closest previously existing edit point.

Double Press this key (CLIP) to Smart Insert the entire source clip, ignoring any In and Out points previously set on the clip.

(Top) Before doing a Smart Insert, (Bottom) After inserting clip DD between clips AA and BB

APPND (Append) / CLIP

The position of the playhead is ignored; incoming clips are always placed after the last clip in the Timeline.

Double Press this key (CLIP) to append the entire source clip, ignoring any In and Out points previously set on the clip.

Performing an Append edit of clip DD to the Timeline

RIPL O/WR (Ripple Overwrite)

At its simplest, Ripple Overwrite substitutes a clip in the Timeline with an incoming clip. If you use Ripple Overwrite on a clip on Track 1, this will automatically move all clips that are to the right of the affected clip in the Timeline either forward to make room, if the incoming clip is longer, or back to eliminate gaps, if the incoming clip is shorter.

Performing a Ripple Overwrite to substitute an entire clip at the playhead (BB) with the incoming clip (DD)

TIP: Using Ripple Overwrite is an efficient way to audition different takes of the same shot without disrupting the narrative flow of the entire scene.

CLOSE UP / YPOS

Pressing this key reframes a clip as a zoomed-in close up to make up for a lack of actual close ups that would have been shot with either longer lenses, or by moving the camera closer to the subject. This function is particularly useful when you're working with 4K media in a 1080 timeline, or 8K media in a 4K timeline, which enables you zoom into existing wide shots to create medium shots, or medium shots to create close up shots, with no loss of quality.

Performing this edit adds the incoming clip as an approximate 20% to 40% zoomed close up and also performs a face detection. If a face or faces are found, it automatically re-positions the face top center in the frame. You can always reposition the close up manually using the Sizing controls in the Inspector.

Press and Hold this key (YPOS) to adjust the Y position of the Clip using the search dial.

How this key works depends on the mode that is active in the Cut page.

Source mode:
The selected clip in the Source Tape view is edited into the Timeline as a close up, duration based on the In and Out points set in the clip, and the Smart Indicator on the Timeline.

Timeline mode:
The clip under the playhead has a Close Up applied to it, and is copied to the track above it, with a 5 second duration starting from the playhead position.

Live Overwrite mode:
This will perform a Close Up on the selected camera as it's overwritten into the Timeline.

The LED on this key will then illuminate, to show you that this mode is armed.

PLACE ON TOP

This key lets you edit the incoming clip as a superimposition above whatever other clips are in the Timeline; the incoming clip is always placed on top, so if there are clips in Tracks 1, 2, and 3, the incoming clip is automatically placed on Track 4, regardless of which track is selected. The frame the incoming clip aligns with depends on the following:

- The incoming clip aligns with the closest Timeline edit point in proximity to the playhead (as shown by the Smart Indicator) if no Timeline In or Out points have been defined. The playhead is ignored.
- The incoming clip aligns with a Timeline In point if one has been set.
- The incoming clip's Out point will align with a timeline Out point if one has been set without an In point. This "backtimes" the clip.

(Top) Before placing a clip on top, (Bottom) After editing clip DD into the Timeline with a Place on Top edit

SRC O/WR (Source Overwrite)

This edit requires overlapping timecode in multiple clips and Track 1 of the Timeline to work properly, such as when recording synced timecode to multiple cameras during a multi-cam shoot. If there is no overlapping timecode, this edit does nothing.

If you are working with footage from multiple cameras that have synced timecode, then the easiest way to use this edit type is to set In and Out points over a clip in the Timeline where you want to cut away to another angle. In the following example, a wide shot of a cooking show covers the moment when the chef starts slicing a chili.
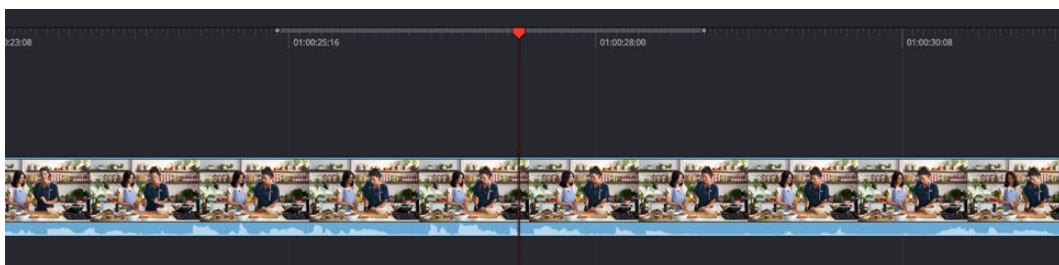
Setting timeline In and Out points to identify a cutaway

You can then select a clip in the Media Pool that corresponds to the desired angle you want to add as a cutaway, which has synced timecode that overlaps with the clip on Track 1 in the Timeline. Don't set In and Out points; if necessary, you can clear previously set In and Out points by pressing Option-X.
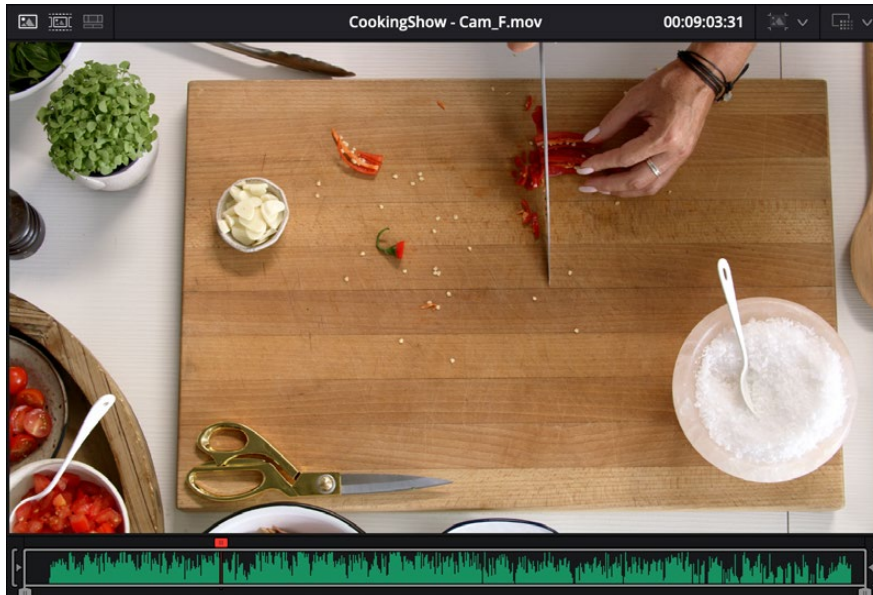
Choosing a Media Pool clip from another camera that has overlapping timecode

When you click the Source Overwrite key, a synced section of the selected Media Pool clip will be edited into the Timeline between the In and Out points you placed, superimposed on top. The result is a perfectly timed cutaway.
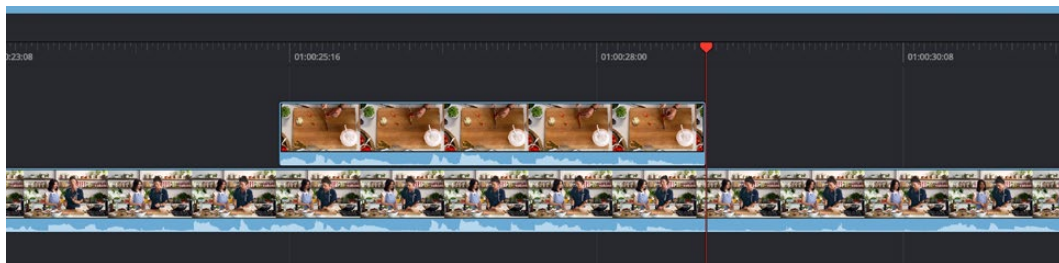
Using Source Overwrite to edit a superimposed and synced section
of the source clip into the Timeline between the In/Out points

Alternatively, you can also use Source Overwrite to automatically place a source clip with a marked In/Out region on top of a clip in the Timeline so that its timecode syncs with the timecode of the Timeline clip, when you don't know exactly how much of the incoming source clip you want to edit into the Timeline, and you just want it synced appropriately.

Search Dial Live Trimming Tools

Several of the most powerful features of the DaVinci Resolve Speed Editor involve the intuitive trimming controls afforded by the search dial.
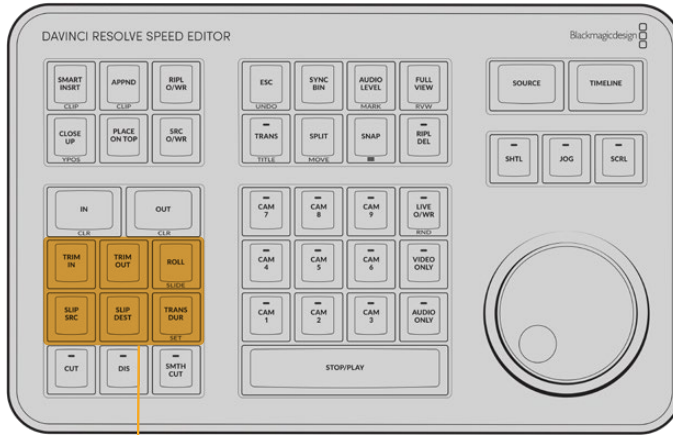
The Trimming tools

TRIM IN

When this key is pressed and held, it lets the user trim the nearest In point on the Timeline (as shown by the Smart Indicator), by simply rotating the search dial back and forth. The trim point is highlighted in green. Release the key to confirm the edit.

In Source mode, holding this key and rotating the search dial adjusts the In Point of the clip in the Viewer.

TRIM OUT

When this key is pressed and held, it lets the user trim the nearest Out point on the Timeline (as shown by the Smart Indicator), by simply rotating the search dial back and forth. The trim point is highlighted in green. Release the key to confirm the edit.

In Source mode, holding this key and rotating the search dial adjusts the Out Point of the clip in the Viewer.

ROLL / SLIDE

When this key is pressed and held, it lets the user trim the nearest transition point (as shown by the Smart Indicator), and roll the edit point back and forth between the clips by simply rotating the search dial. The trim point is highlighted in green. Release the key to confirm the edit.

Double Press and Hold this key (SLIDE) to Slide the entire clip back and forth in the Timeline. A four-way multiview will show the In and Out points for both source and destination clips as you slide.

SLIP SRC (Slip Source)

When this key is pressed and held, it allows the user to slip in place the footage of the clip to the left of the Smart Indicator back and forth by moving the search dial. A four-way multiview will show the In and Out points for both source and destination clips as you slip. The clip that will slip will be highlighted in orange. Release the key to confirm the edit.

SLIP DEST (Slip Destination)

When this key is pressed and held, it allows the user to slip in place the footage of the clip to the right of the Smart Indicator back and forth by moving the search dial. A four-way multiview will show the In and Out points for both source and destination clips as you slip. The clip that will slip will be highlighted in orange. Release the key to confirm the edit.

TRANS DUR (Transition Duration)/SET

Holding down this key when a transition is under the Smart Indicator will allow you to change the duration of the transition using the search dial. Turning the dial left will shorten the transition, and right will lengthen it. Once the duration is correct, release the key.

Double Pressing this key (SET) allows you to set the current transition length as the default transition duration.

> **TIP:** Multiple transitions can be changed at the same time by holding down Command and selecting the transitions on the Upper Timeline, then pressing the appropriate transition key (CUT, DIS, SMTH CUT).

Transition Keys

This set of keys provide immediate shortcuts to the most commonly used transition commands.
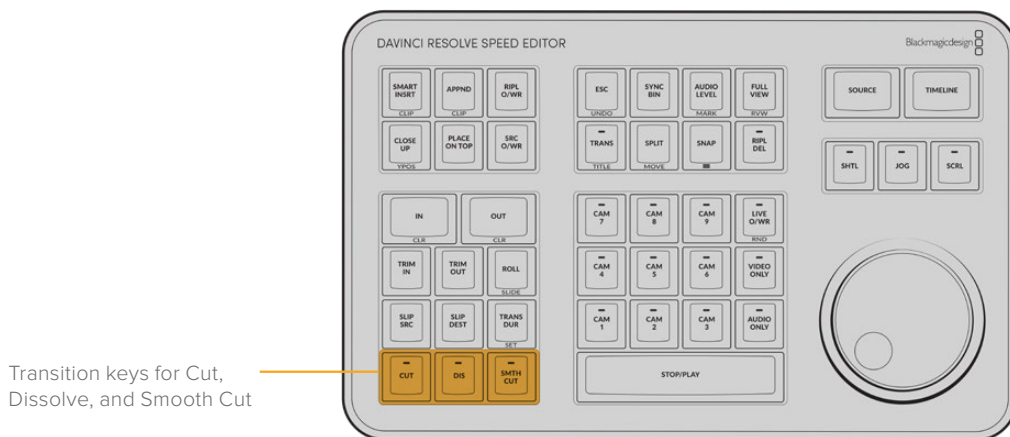
Transition keys for Cut, Dissolve, and Smooth Cut

CUT

This key will set a simple cut at the Timeline edit point, as shown by the Smart Indicator. If there is another transition already present there, it will replace it.

The LED on this key will illuminate to show you the Cut Transition is armed in Live Overwrite mode.

DIS (Dissolve)

This key will add a one second dissolve centered between the two shots at the Timeline edit point, as shown by the Smart Indicator. If there is another transition already present there, it will replace it.

The LED on this key will illuminate to show you the Cut Transition is armed in Live Overwrite mode.

SMTH CUT (Smooth Cut)

This key will add a Smooth Cut transition centered between the two shots at the Timeline edit point, as shown by the Smart Indicator. If there is another transition already present there, it will replace it.

The LED on this key will illuminate in Live Overwrite mode to show you the Cut Transition is armed.

Smooth Cuts are special-purpose transitions designed to make short jump cuts in the middle of a clip unnoticeable. This is done by using optical flow processing to match the same features on either side of a cut in order to automatically morph a subject from one position to another over the duration of the transition.

The Smooth Cut effect works best on clips such as sit-down interviews and close-up head shots with a minimum of background and subject motion, and where the subject's position on either side of the cut is not significantly different. A good example of when Smooth Cut is effective is when you're cutting pauses, partial repeats, filler sounds such as "um" or "you know," or other speech disfluencies out of an interview clip to tighten the dialog, and you want to eliminate the little "jump" that occurs at the cut without having to cut away to B-roll. Applying a short two- or four-frame Smooth Cut transition to the edit can make this kind of edit invisible, as long as the speaker doesn't change position significantly during the cut. The more motion there is in the background of the shot, and the more the speaker changes position, the harder it will be to get a useful result using Smooth Cut. Although the default duration for any transition is one second, you'll find that Smooth Cut transitions may work much better when they're short; 2- to 6-frame Smooth Cut transitions often work best to disguise jump cuts.

Function Keys

Function Keys
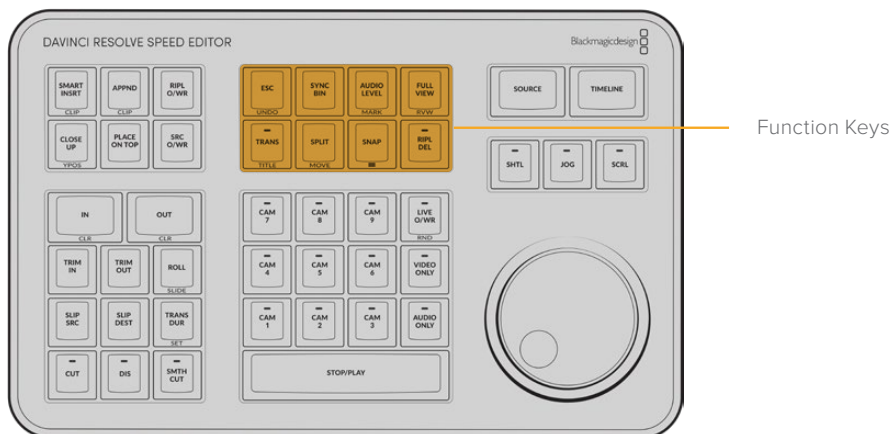
ESC / UNDO

This key functions the same way as the escape key on your keyboard, but in the Cut page it is also used to clear a selected camera in the Sync Bin.

Double press this key (UNDO) to undo your last action. Multiple double-presses take you back through the Undo history.

SYNC BIN

This key will open up the Sync Bin for easy multi-camera editing. For more information on using the Sync Bin see Chapter 20, "Fast Editing in the Cut Page" in the DaVinci Resolve Reference Manual.

Distance Indicators to Adjacent Edits

When using the Speed Editor's search dial while using the Sync Bin, the Cut page playhead in the lower timeline now has two small windows to either side showing the distance to the nearest edit. The left window shows the time to the nearest previous edit, and the right window shows the time to the next previous edit. Both windows are in seconds:frames (SS:FF) format. This feature allows you to quickly jump to, or modify an edit point using the direct timecode entry method.

The Distance Indicators when using the Search Dial in the Sync Bin. The left window is showing one second and ten frames to the previous edit, and the right window is showing thirty three frames to the next edit as shown by the smart indicator.

AUDIO LEVEL / MARK

Press and holding the Audio Level key allows you to adjust the selected clip's Volume parameter by rotating the Search dial. If no clip is selected it will modify the clip on the highest track under the playhead.

Double pressing this key (MARK) adds a marker placed at the playhead's current position. Double press again to enter the marker's editing dialog box to add comments, durations, etc.

Double press and holding this key allows you to set the color of the marker before you add it, by rotating the search dial.

Double pressing and holding down the Audio level/Mark key brings up a rotary marker color selector that you can navigate with the search dial

FULL VIEW / RVW

Pressing this key expands the Viewer to Full View mode on the interface monitor. Pressing this key again returns the Viewer to its normal mode.

Double press this key (RVW) to review your edit. This function plays back a pre-roll before and post-roll after the last edit in Full View mode. The pre- and post-roll time durations can be set in the Editing section of the User tab in the DaVinci Resolve preferences.

TRANS / TITLE

Press and hold this key to bring up a drop-down menu of your available transitions in alphabetical order and an icon describing their shape. Rotating the search dial left and right will navigate you through the list. When you find the transition that you want, simply release this key and it will be placed at the Timeline edit point as shown by the Smart Indicator.

Double press and hold this key (TITLE) to modify the font of an existing title. If the playhead is over a basic title and this key is held, you can rotate the search dial to change the font of the title. This only modifies the first text element in a title. Once you've selected your font, release the key to set it.

The LED on this key will illuminate to show you the Standard Transition is armed in Live Overwrite mode.
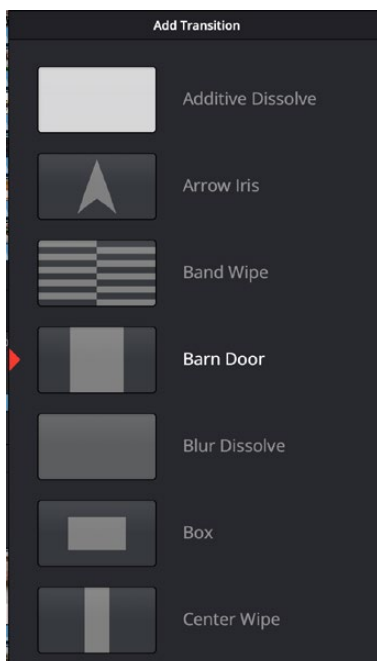
Drop-down Transition menu

SPLIT / MOVE

Press this key to create a new cut in a clip at the playhead position. The cut will affect all clips under the playhead if more than one track is being used.

If the playhead is over an existing split, pressing this key will remove the split and join the two parts of the clip back together.

Double press this key (MOVE) to move your selected clip in the Timeline. Using the search dial, you can move the clip backwards and forwards in the Timeline from edit to edit. The Timeline will reflow to adapt to your clip placement. When you find the place you want to move your clip to, release the key to set it.

SNAP / (Viewer Resize)

Press this key to enable the Snapping mode designed specifically for the search dial. With snap turned on in Jog mode, and when the search dial is rotated very slowly, the playhead will briefly pause at each edit point in the Timeline. This key has an LED to show you when this mode is active.

Double press and hold this key (Three Lines) to dynamically resize the Viewer window using the search dial. Rotating the dial to the left increases the Viewer size, and to the right decreases it.

RIPL DEL (Ripple Delete)

Pressing this key will delete the selected clip or clips, and then close any gaps that occur by rippling the Timeline to the left. If no clip is selected, this key will ripple delete the clip under the playhead.

Sync Bin Multi Camera Selection
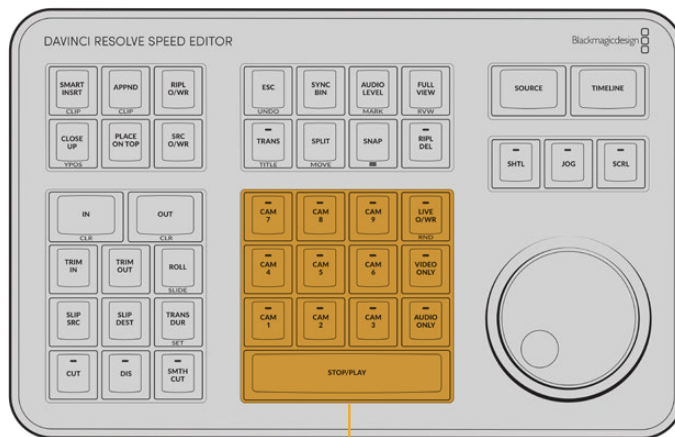
The Camera and Live Overwrite keys
along with the play bar

VIDEO ONLY

Press this key to only allow the video from your source clip into a video track on the Timeline. This key has an LED to tell you when it is active. Press this key again to deactivate.

AUDIO ONLY

Press this key to only allow the audio from your source clip into an audio track the Timeline. This key has an LED to tell you when it is active. Press this key again to deactivate.

STOP/PLAY

This key starts and stops playback on your Timeline or source media. It's conveniently arranged for using your thumb, while your fingers are on the search dial.

CAM 1-9

These keys only function in Sync Bin view. Each camera key allows you to choose its corresponding camera angle as active in the Sync Bin. Pressing any Camera key will expand that camera angle into the Source Clip view, making it easy to set specific In and Out points and perform edit functions. You can change camera angles instantly in the Source Clip view by simply pressing another Camera key. If you wish to return to the Sync Bin view, press the Escape key.

These keys illuminate and have a switcher-like function in Live Overwrite mode, as explained below.

Live Overwrite Mode

The Live Overwrite mode in the Speed Editor can be thought of as switching a live Multicam shoot without all the annoying constraints of linear time. With all the camera angles locked together in the Sync Bin, you can perform and trim all the edits, transitions, and camera switches, you want and never go out of sync. Every edit you make will be perfectly synchronized to the Timeline automatically.

LIVE O/WR (Live Overwrite Mode) / RND (Random)

Press this key to enter Live Overwrite mode. An LED will illuminate to tell you this mode is active. It immediately activates the Sync Bin and the Multicam Viewer, and switches the Speed Editor into a different mode, slightly changing the functionality of several keys to accommodate the Live Overwrite workflow. A key that is in Live Overwrite mode has an LED light illuminate to let you know that the key's function is currently active.

Double Press this key (RND) to edit a Random camera angle with a random duration into the Timeline from the Sync Bin.

Using Live Overwrite Mode

Editing Multicamera shoots in Live Overwrite mode starts with the base layer on track V1. The clip you put here has two additional functions other than its video content. First, it provides a continuous timecode track that is the foundation of all the Sync Bin functionality. Second, it provides content to measure all of the ripple functions against.

> **NOTE:** Live Overwrite Mode only works with clips in the Sync Bin. If there are no clips set in the Sync Bin, this mode will not function. For more information on setting up the Sync Bin, see Chapter 20, "Fast Editing in the Cut Page," in the DaVinci Resolve Reference Manual.

A good starting point is to place your master camera angle, uninterrupted from beginning to end on track V1. You will be able to edit this track, remove whole sections, and re-arrange it as necessary later in the process, but for now, this master clip on V1 will serve as the backbone of the edit.

Live Overwrite mode, with the master camera angle (Cam 4) edited in on track V1

Once the master clip of the Sync Bin is on V1, you can start using the Live Overwrite mode in earnest. The concept to understand about Live Overwrite is that this method of editing bypasses traditional In and Out points all together, and edits are performed with the Camera keys working in conjunction with the Search Dial.

Performing a Live Overwrite edit:

1   Press the Live O/WR button to activate the mode. The LED on the key will illuminate.

2   Use the search dial to navigate the Sync Bin to where you want to make an edit (switch camera angles). You will notice all cameras and the Timeline will move together in sync.

3   Select a camera angle in the Multicam Viewer you wish to edit in, and press and hold the corresponding Camera key on the Speed Editor, while rotating the search dial forward. This will edit in a new clip on top of the V1 track, and you can use the search dial to immediately set its duration.

4   Release the Camera key to set the edit.

Performing a Live Overwrite by holding down the Camera 5 key and rotating the search dial to the right

From here you can immediately press and hold another Camera key and rotate the search dial to continue the Multicam edit. You can think of this method as "painting-on" clips to the Timeline, rather than inserting them. Clips edited in this fashion will never overwrite other clips on the same track. Live Overwrite will always add the clip to the next highest track, and create a new track automatically if necessary.

"Painting-on" the next edit by holding down the Camera 7 key
and rotating the search dial to the right

Continuing the edit from here does not require working in a linear fashion. Because the master track is on V1, you can skip ahead anywhere on the Timeline and start "painting-in" camera angles wherever you wish, and because the Timeline and Source clips are locked together in the Sync Bin, whatever edit you add will always be in perfect sync.

Live Overwrite Mode Key Modifiers:

Selecting Live Overwrite mode subtly changes the functions of many keys on the Speed Editor, so they work in conjunction with this mode. Each of these keys has an LED that illuminates to tell you the function is active before you perform a Live Overwrite edit.

- **CUT:** Automatically adds a simple cut to the beginning of each clip edited to the Timeline. This option is also effectively no transition added.

- **DIS:** Automatically adds a Cross Dissolve transition to the beginning of each clip edited to the Timeline. If the edited clip is immediately adjacent to another clip on the same track, the dissolve will be centered on the cut. If there is no clip immediately adjacent, the dissolve will start on the edit instead, and dissolve from the video on the track underneath the clip.

- **SMTH CUT:** Automatically adds a Smooth Cut transition to the beginning of each clip edited to the Timeline. If the edited clip is immediately adjacent to another clip on the same track, the Smooth Cut will be centered on the cut. If there is no clip immediately adjacent, the Smooth Cut will start on the edit instead, and Smooth Cut from the video on the track underneath the clip.

- **TRANS:** Automatically adds whatever transition is set as the "Standard Transition" in the Transitions panel to the beginning of each clip edited to the Timeline. If the edited clip is immediately adjacent to another clip on the same track, the transition will be centered on the cut. If there is no clip immediately adjacent, the transition will start on the edit instead, and transition from the video on the track underneath the clip.

- **CLOSE UP:** Automatically performs a Close Up action on the camera as its edited into the Timeline.

Chapter 4

Media and Edit Page Improvements

The Media and Edit pages have numerous improvements spanning the gamut of editorial workflow. More clip functionality in the Media Pool, enhanced integration with Fusion, and better Timeline management are all included in this release.

Contents

Media Pool Improvements

A variety of new features have been added to the Media Pool, which make it easier to set up and import clips into a timeline.

Converting Compound Clips or Timelines to Multicam Clips

It's now possible to convert compound clips and timelines into multicam clips for easier editing using the Edit page's Multicam Editing interface. This conversion is a one-way process. You cannot reconvert a multicam clip back to a timeline or compound clip. If you wish to preserve the original timeline or compound clip, make sure to duplicate it first, and then convert the copy. For more information, see Chapter 32 "Multicam Editing" in the DaVinci Resolve Reference Manual.

To convert a compound clip or timeline to a Multicam clip:
– Right-click on the clip or timeline in the Media Pool and choose "Convert Compound Clips (Timelines) to Multicam Clips" from the drop down menu.

Insert Selected Clips to Timeline Using Timecode

Clips can now be edited directly from the Media Pool into a timeline, such that each clip's source timecode is aligned with an identical record timecode value in the Timeline. This can be useful for long form multi-camera events, like weddings or concerts, where all cameras are linked by the same timecode to ensure all edits are perfectly synced. This function matches the Source Overwrite edit on the Cut page.

> **IMPORTANT:** The timecode of the Timeline must overlap the timecode of the clip(s) for this edit to function. This can be set in the Start Timecode field of the New Timeline settings.

To insert selected clips to timeline using timecode:

1 Select one or more clips to edit into the Timeline in the Media Pool. If there are In and Out points set on the clip, the edit will respect those boundaries. If no In/Out points are set, each selected clip's full duration will be edited in its entirety.

2 Set a destination control to determine which track in the Timeline you want to edit to.

3 Right-click one of the selected clips and choose "Insert Selected Clips to Timeline Using Timecode" from the drop-down menu.

4 All of the selected clips will be overwritten into the Timeline at their appropriate timecode locations onto the destination track.

> **IMPORTANT:** If multiple selected clips have overlapping timecode, no edit will occur.

Insert Selected Clips to Timeline with Handles

This command inserts multiple clips into the Timeline serially, using the current sort order of the Media Pool, with handles subtracted from the current In and Out points of each clip (using the Default Handles Length in the Editing panel of the User Preferences). Combined with the Add Transition tool (Command-T), this function is useful when quickly creating montages from multiple clips.

To insert clips with handles to the Timeline:

1   Select the clips to insert into the Timeline with handles in the Media Pool.

2   Right-click any selected clip, then choose "Insert Selected Clips to Timeline With Handles." The clips will be inserted starting at the Timeline In point with the default handles length already calculated.

> **TIP:** To finish creating the montage, select the clips in the Timeline, then choose "Add Transition" (Command-T) from the Timeline menu. This will apply the default transition to all of the clips at once.

Ability to Create Timelines with Audio Mixer Presets

For advanced audio workflows and ease of use with Fairlight, you can now create a timeline with pre-assigned audio tracks using a previously created Fairlight Configuration preset. To use this function, create a new timeline, and check the "Use Fairlight Configuration Preset" box. A drop-down menu then appears, allowing you to select the specific preset for the Timeline.

You can create Fairlight Configuration presets using the Fairlight Presets Library, available from the Fairlight menu. For more information, see Chapter 150 "Setting up Tracks, Buses, and Patching" in the DaVinci Resolve Manual.

Support for Importing Boris Continuum FX with AAF Timelines

Boris Continuum FX effects and settings will now be imported along with a timeline via AAF export. You'll need to have the same Continuum suite of effects installed on both machines (OFX version for DaVinci Resolve, AVX for Avid). When importing an AAF, Boris Continuum effects that were used in the original NLE will appear on each affected clip in the resulting DaVinci Resolve timeline, with all previously applied parameters available in the inspector. The Sapphire and Mocha suites are not available for AAF import at this time.

Import XML, EDL, and AAF Timelines with an Empty Media Pool

It is now possible to import an XML, EDL, or AAF file into DaVinci Resolve without having any of that timeline's corresponding media in the Media Pool.

Timeline Improvements

There have been several new features that improve timeline functionality in terms of playback, organization, and interoperability with other pages in DaVinci Resolve.

Convert Fusion Compositions to Edit Effects

If you have created a Fusion Composition that you would like to use across a number of projects, you can now save it to the Effects toolbox in the Edit page. This allows easy access to the effect from the Edit page, and simple application to video clips in the Timeline.

To convert a Fusion composition to an Edit effect:

1   Export the composition as a macro in Fusion, by right clicking on a node and selecting Create Macro from the contextual menu.

2   Save the macro file (.setting) to the following directory:

   –   **MacOS:** /Library/Application Support/Blackmagic Design/DaVinci Resolve/Fusion/ Templates/Edit/Effects

   –   **Windows:** C:\ProgramData\Blackmagic Design\DaVinci Resolve\Fusion\Templates\ Edit\Effects

   –   **Linux:** /opt/resolve/Fusion/Templates/Edit/Effects

   The effect will now be available as a drag and drop effect in the "Fusion Effects" section of the toolbox in the Effects Library on the Edit page.

Change Transitions to Fusion Compositions

If you need to create a more complex transition than you can get from the Inspector, it is now possible to change any transition to a Fusion Composition on the Edit Page timeline.

To convert a Resolve transition to a Fusion composition:

1   Add a transition between two clips on your Timeline.

2   Right-click on the transition and select "Convert to Fusion Cross Dissolve."

3   Right-click on the transition again and select "Open in Fusion Page."

A new Fusion composition opens with the base Cross Dissolve nodes and tools already set. You now can use all of the powerful tools in the Fusion page to customize your transition.
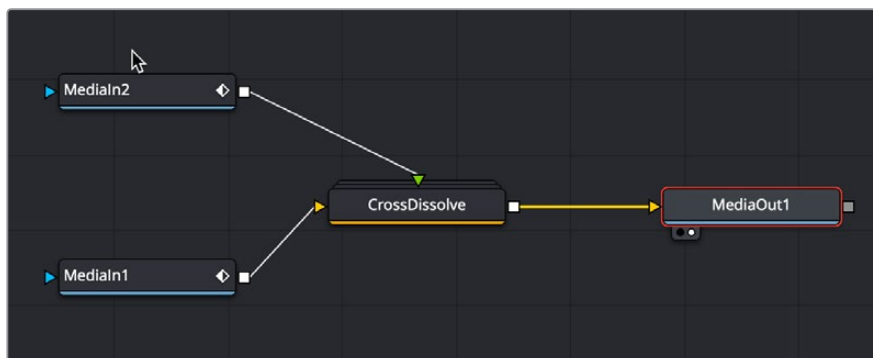
The node tree you start with after converting a transition to a Fusion Cross Dissolve

Scroll Wheel Controls on Timeline

Additional Scroll Wheel Timeline controls have been added to the Edit page Timeline.

To manipulate the Timeline, rotate the scroll wheel while holding down:
- **Shift:** Expands or contracts all the Video or Audio track heights, depending on what section the pointer is located at when you scroll.
- **Option:** Zooms in and out the view of the Timeline.
- **Command:** Navigates forwards and backwards in the Timeline.

Zoom Around Mouse Pointer

You can set up the Edit Timeline zoom controls to stay centered on the pointer as you zoom in or out, instead of staying centered on the Timeline playhead as usual, by selecting View > Zoom Around Mouse Pointer. This can be helpful when navigating longer timelines.

With this option enabled, zooming in and out of the Timeline using the scroll control of your pointing device while holding the Option key down keeps the Timeline centered on the pointer. Deselect this option to return to the behavior of only zooming in or out centered on the playhead position.

Fast Review on the Edit Page

The Fast Review feature of the Cut page is now available in the Edit page. Fast Review plays back your timeline at variable fast forward speeds where the speed of playback is dependent on the length of each clip on the Timeline. Longer clips play back at faster speeds than shorter ones. This feature is designed to allow you to quickly scan through a large amount of material on a timeline.

To use the Fast Review feature on your Edit Page timeline, select Playback > Fast Review. Pressing K or the spacebar will return you to the normal JKL playback mode. If you use this feature often you can bind Fast Review to a specific key in the Keyboard Customization window.

> **NOTE:** Fast Review does not work for clips in the Source Viewer, only for timelines in the Timeline Viewer.

Create Timeline Using an IMF or DCP Composition Playlist (CPL) (Studio Only)

You can now create a timeline in DaVinci Resolve that exactly replicates the Composition Playlist (CPL) of a DCP or IMF package.

To create a timeline using a Composition Playlist (CPL):
1. Import an IMF or DCP package into the Media Pool, like any other piece of media.
2. Right-click on the imported clip and choose "Create New Timeline Using Composition Playlist" from the contextual menu.
3. In the New Timeline dialog box, choose a specific CPL from the package in the "Composition Playlist" dropdown menu.
4. Make any other normal New Timeline adjustments you may need (such as Resolution, Aspect Ratio, etc.), then click the "Create" button.

Track Heights Independent of Thumbnail Settings

Track heights in the Edit page are now independent of the Thumbnail and Waveform view settings in the Timeline View options. Previously, specific Timeline viewing options such as Filmstrip or Thumbnail view had minimum track height settings. Now you can freely change track height no matter what options you've chosen, and resizing one or more tracks below the minimum height for filmstrips or thumbnails automatically collapses those tracks into Simple view to avoid clutter.

Support for DCTL Based Transitions

DCTL based transitions are now supported in DaVinci Resolve, and can be found in the Transitions section of the Open FX category of the Effects Library. See the DaVinci Resolve Developer Documentation in the help menu for more details.

Improved Frame.io Marker Navigation (Studio Only)

You can now specifically navigate only markers created in Frame.io while in the comment dialog of a Frame.io marker, using the Previous Marker (Shift-UpArrow) and Next Marker (Shift-DownArrow) commands. This allows you to skip directly from comment to comment in Frame.io without having to either navigate all markers in-between, or double-click each Frame.io marker individually to respond. Frame.io interoperability is a Studio Only feature.

Improved Take Selector and Retime Control Behavior

Active Retime and Take Selector controls can now be closed by pressing the Escape key or toggled on and off by repeatedly pressing the control's assigned keyboard shortcut.

Viewer Improvements

The Viewers in DaVinci Resolve have been updated with several usability improvements.

Ability to Monitor HDR and SDR From the Edit Page

You can now view HDR and SDR outputs of your timeline simultaneously from the Edit page. The SDR signal will be mapped to the first output of your video I/O device, and the HDR signal will be mapped to the second. This functionality was previously only available in the Color page.

Ability to Monitor Stereoscopic 3D From the Edit Page

You can now view a Stereoscopic 3D signal directly from the Edit page. Previously, the Edit page was restricted to left eye for both outputs. The Edit Page Viewer now displays Stereoscopic 3D identically to the Color Page Viewer. The 3D palette in the Color page has the stereoscopic controls to select the stereo viewing options (Side by Side, Anaglyph, Line by Line, etc.), as well as adjusting the convergence and other stereoscopic parameters.

For more information on setting up 3D output, see Chapter 172 "Stereoscopic Workflows" in the DaVinci Resolve Reference Manual.

Ability to Copy and Paste Timecode in Viewers Based on Timecode Mode

You can now copy and paste timecode values directly from timecode fields in the viewers across the Media Pool, and Cut, Edit, and Deliver pages.

To copy and paste between timecode fields:

1   Choose the appropriate timecode mode (Source/Record/Frames/KeyKode, etc.) by right-clicking on the timecode field in the Viewer and choosing the mode you want to copy from.

2   Right-click again in the timecode field and choose Copy Timecode.

3   Right-click on any other Viewer's timecode field, and choose Paste Timecode to paste that value.

Additional Viewer Wipe Modes for Offline Reference Clips

Three new wipe modes have been added to the Offline Viewer, that allow you to check the sync between your current timeline and its Linked Offline Reference Clip. You can open the Offline Viewer by choosing Offline in the Source Viewer Mode drop-down menu, and then right-clicking in the Program Viewer to select the wipe type. These new modes are:

- **Diagonal:** Lets you compare both halves of the wipe via an adjustable diagonal border. Dragging the pointer repositions the wipe to the left and right. Hold the option key down and drag while moving the pointer around in a circle to rotate the border of the wipe to any angle you like.

- **Venetian Blind:** Lets you compare both images being wiped via alternating horizontal strips. Drag the pointer up or down to change the size of the alternating strips. Good for quickly comparing vertical color uniformity, focusing on color and contrast changes that occur from top to bottom.

- **Checkerboard:** Lets you compare both images being wiped via an alternating checkerboard. Drag the mouse left or right to alternate between images by squeezing each check horizontally. Good for comparing color uniformity across the width and height of two images.

Editing Improvements

The following improvements aid everyday editing functionality.

Updated Selection Methods on the Timeline

Clip selection no longer automatically moves along with the playhead. Instead, a new set of commands lets you create and move a selection by holding down the Command key and pressing the Up, Down, Left, and Right Arrow keys. This allows you to select clips above and below the current track and to the left and right, independently of the playhead.

You can return the Clip Selection mode back to its previous behavior of automatically selecting the clip it's intersecting by turning on the "Selection Follows Playhead" option in the Timeline menu.

Scene Cut Detection on the Timeline

If you need to break down a previously edited video into its component clips for re-editing or color correction, you can now do so directly in the timeline. Using the DaVinci Neural Engine, DaVinci Resolve can automatically analyze and split up an edited video into individual clips.

Timeline Scene Cut Detection is also available in the Cut page. If you prefer, you can continue to use the original Scene Cut Detection tool found in the Media Pool.

To use Scene Cut Detection on the Timeline:

1 Select one or more clips you want to split on the Timeline. Alternately, you can limit Scene Cut Detection to just a portion of a clip by setting In and Out points on the Timeline around the section you want to analyze.

2 Choose Timeline > Detect Scene Cuts.

A dialogue box appears, "Detecting scene cuts in clips x of x." This process can take some time, depending on the length, number, and complexity of the clips you've selected. When the Scene Cut Detection has finished, the clip you selected will be broken up into a number of through edits that now can be used as independent clips.

Checking and Fixing Your Results

If the Neural Engine has made an error, you can fix it manually by navigating to the cut using the Up and Down Arrow keys to go back and forth in the Timeline, and by then doing one of the following:

- **To remove a Cut:** Click the through edit to select it, and press the "Delete" key.

- **To make a New Cut:** Place the timeline indicator at the cut point, and choose Timeline > Split Clips (Command-\).
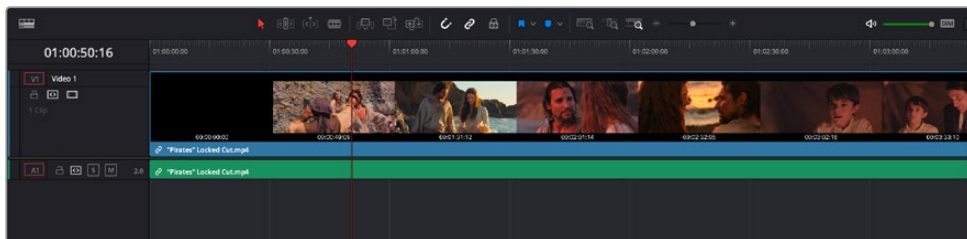
A single clip of a finished edit, consisting of multiple cuts before the Detect Scene Cuts command
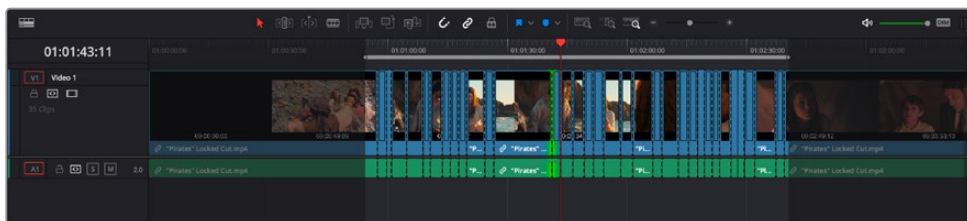
Multiple individual clips extracted from the edited clip via Detect Scene Cut; the operation has been contained by the In and Out points, and one of the resulting through edits has been highlighted in green

Auto Align Clips

DaVinci Resolve now includes more advanced syncing features that are accessible directly from the Timeline. Auto Align Clips slides one or more selected clips to align with the timecode or audio waveforms of another clip that has matching timecode or audio. This function works for video clips, which can be aligned using timecode, and for audio clips which can be aligned using either timecode or waveform matching. Waveform matching can also be used if you're working with audio/video clips.

You can only select one clip per video or audio track to align, and they all will align to whichever clip is on the lowest-numbered video or audio track. Clips selected that have no overlapping timecode or audio waveform will not be moved and left in their original position on the Timeline.

For example, clip A on track V1 overlaps with clip B on track V2, but not with clip C on track V3, or clip D on track V4. Selecting all clips and using Auto Align Edits will slide clip B to align with clip A, but clips C and D won't be moved because they don't overlap with clip A.
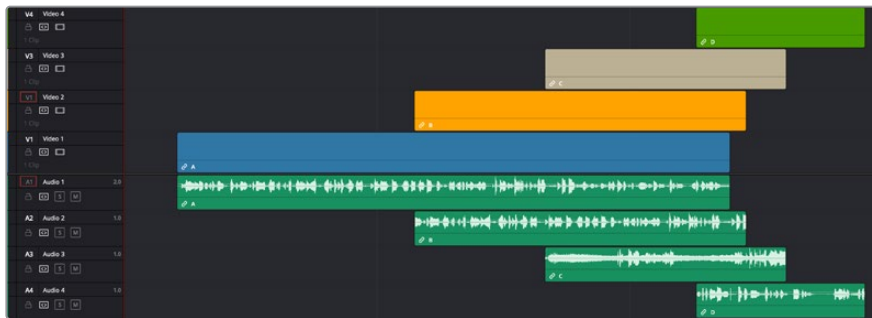
The original Timeline with Clip A (blue) and Clip B (orange) that have some overlapping audio but are out of sync
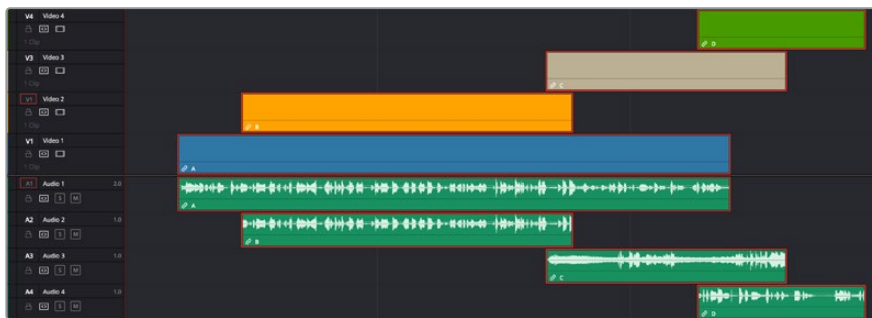
The same Timeline after the Auto Align command; Clip B (orange) has been slipped to sync via audio waveform with Clip A (blue). Clips C (tan) and D (green) were also selected, but because they had no overlapping timecode or audio, they remained in place.

In another example, clip A on track V1 overlaps with clips B, C, and D on tracks V2, V3, and V4 respectively. Selecting all clips and using Auto Align Edits will slide clips B, C, and D to be aligned with clip A.
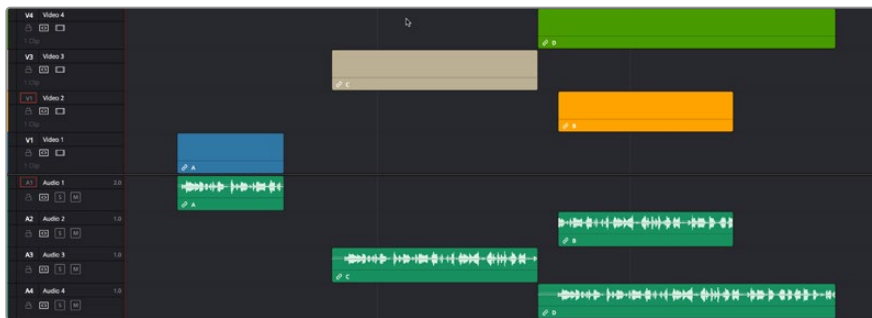
The original Timeline with Clip A (blue), and Clip B (orange), C (tan) and D (green) all have overlapping audio, but are out of sync.
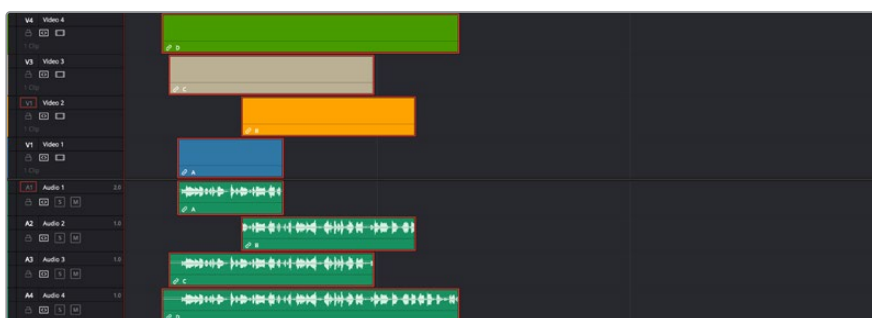
The same timeline after the Auto Align command. All clips are now in sync and the audio waveforms now all match. All the other clips moved to Clip A's (blue) position because it was the lowest clip on the Timeline.

To use Auto Align clips:

1. Arrange the clips you want to align with one another on the Timeline so that there's one clip per track. All clips will sync to the clip on the lowest track number. All clips must have overlapping timecode or audio waveforms.

2. Select every clip that you want to align (only one per track).

3. Right-click one of the selected clips, and choose an option from the Auto Align Clips submenu, either "Based on Timecode," or "Based on Waveform."

If Timecode is selected, the operation will be instant. If Waveform is used, a progress bar will appear showing you how long it will take DaVinci Resolve to analyze the selected audio waveforms before your clips are aligned. If you've selected clips that can't be aligned, a warning box will appear and tell you which clips had errors.

For video, this can be useful for multi-camera editing situations where you want to align an insert with the action of an alternate angle. For audio, this is useful for situations where you have multiple recordings of the same audio that you want to align for further editing.

> **NOTE:** Waveform matching won't work for re-recorded audio, such as dialog that's been re-recorded using the ADR tools of the Fairlight page, as the correspondence between two waveforms must be precise for a match to be found

Delete Gaps Within a Specified Range

The process of deleting gaps in your timeline can now be more targeted. The Edit > Delete Gaps command now respects both In/Out ranges and clip selections on the Timeline.

Chapter 5

Cut and Edit Page Effects

DaVinci Resolve 17 brings several enhancements to working with effects in the Cut and Edit pages. A new Burn Away transition, Edit Timeline compositing tools, and many usability improvements are available in this release.

Contents

Render in Place

Render in Place allows you to render and bake in all effects that are applied to a single clip on the Edit page Timeline. This command, which only works in the Edit page, creates an entirely new media file that replaces the original clip on the Timeline. This new file is created in the same directory as the original source file and is added to the Media Pool automatically.

You can use Render in Place to improve the playback performance of a computationally intensive clip, or use it to create a new high-quality master media with effects that have been finalized baked in. For example, perhaps you have created a clip with a complicated speed ramp, and you want to pass it to another editor or vfx artist in a round-trip rendering scenario, but you are worried about how other programs may interpret the speed effects. In this scenario you could render the clip in place at master quality, and then render and deliver the program.

Render in Place is not a one way operation. Afterwards, you have the option to "Decompose to Original" to bring back the original clip with the original effects, if you need to make a change because the clip was not really as finalized as you were hoping.

To Render in Place:

1   Select one or more clips on the Edit Page timeline. Selecting multiple clips results in each clip being individually rendered in place, but as a batch operation.

2   Right-click the selection, and choose "Render in Place" from the contextual menu.

3   Choose the appropriate Render Clip Options, and then click the "Render" button.

   – **Start Timecode:** Sets the starting timecode value for the clip.

   – **Format:** Selects the media file format.

   – **Codec:** Selects the video codec.

   – **Type:** Specifies the compression parameters of the selected codec.

   – **Include Handles:** Gives you the option to specify the number of frames before and after the clip In/Out points to be rendered.

   – **Include Video Effects:** Turn on this checkbox to bake in all effects that have been applied to the clip, including Fusion compositing, sizing, Open FX or Resolve FX, speed effects, and grading. Turning this checkbox off renders the clip with speed effects baked in, but no other effects applied.
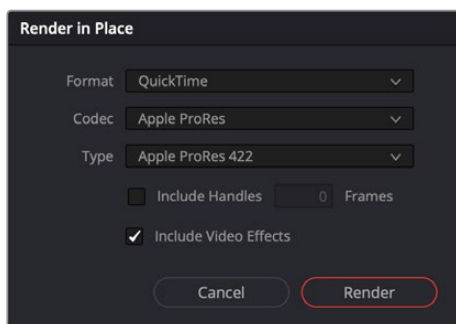
The Render in Place options

4   Use the File dialog that appears to choose where you want to save the resulting media. Choose a location and click Open.

   A progress bar appears to show you how long this will take. When finished, your new media is saved in the designated location, added to the Media Pool, and will replace each corresponding source clip on the Timeline.

If you've used Render in Place and end up having buyer's remorse, or a late-breaking change comes back to you later, you can easily decompose to the original clip with its editable effects to make the change.

To Decompose to Original:

1 Select one or more clips that have already been Rendered in Place, on the Edit Page timeline.

2 Right-click the selection, and choose "Decompose to Original" from the contextual menu.

The original clip, along with all of its editable effects, will be returned to the Timeline. The new media created in the Render in Place process will not be deleted from the source folder, nor will it be removed from the Media Pool. It is effectively a new clip.

Smart Reframe (Studio Only)

The new Smart Reframe feature in DaVinci Resolve 17 makes it easier to quickly reframe material across extreme aspect ratio changes. It's useful for situations where you've shot a 16:9 horizontal video and find yourself needing to create a vertically-oriented 9:16 version for mobile phones and social media deliverables, or using 4:3 archival footage in a 2.39:1 widescreen movie. Smart Reframe can be used manually, or automatically executed using the DaVinci Resolve Neural Engine.
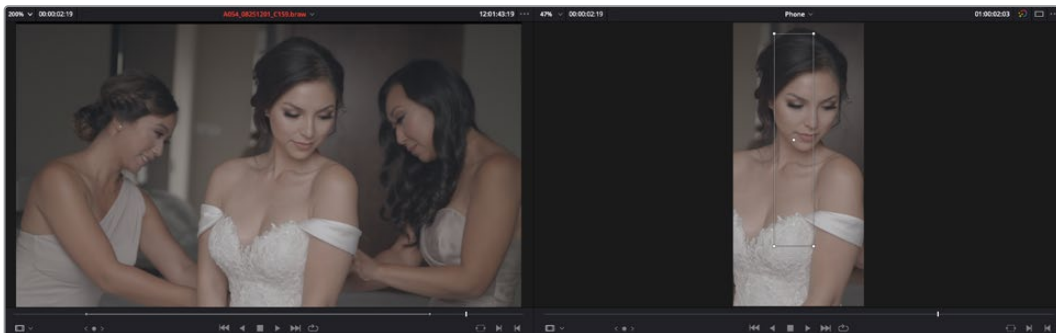
Smart Reframe in action, with the Reference Point bounding box active (right)

The Smart Reframe tool is found in the Sizing tab of the Inspector and is available in both the Cut and Edit pages.

To use the Smart Reframe tool:

1 Duplicate your timeline, right-click the Timeline and choose Timelines > Timeline Settings, and click Use Custom Settings to change the Timeline Resolution to the aspect ratio needed for delivery. Make sure that "Mismatched resolution files" is set to "Scale full frame with crop," and click OK.

2 Select one or more clips you want to reframe, and open the Inspector to the Sizing tab.

3 Open the Smart Reframe controls, leave the Object of Interest drop-down menu set to Auto (if you've selected more than one clip, Auto is the only setting available), and click "Reframe." DaVinci Resolve will analyze your footage and should automatically adjust each individual clip's position to a more aesthetically pleasing framing.

4	(Optional) If the "Auto" setting does not give you desirable results for a particular clip, you can manually select the main subject using the following steps.

    a.	To manually select the subject area, choose "Reference Point" from the Object of Interest drop-down menu, and click the target icon just to the right of the menu. This automatically sets the Viewer mode to Smart Reframe, exposing the onscreen controls for choosing a reference.

    b.	Drag the Reference Point bounding box around the main subject of interest in the frame. You may use the Transform controls directly above in the Inspector to move the source clip around if your subject is outside the current framing.

    c.	Click "Reframe."
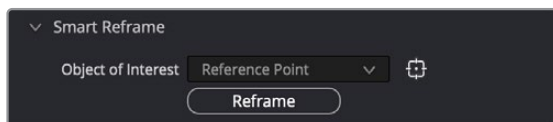
The Inspector's Smart Reframe controls
showing the manual reference point selected

DaVinci Resolve locks onto and, if necessary, tracks your subject using the reference you've selected, automatically panning and scanning the original clip as needed to keep the reference within the new aspect ratio. While involving a bit of manual adjustment, this function still dramatically reduces the time involved in pan and scanning footage by manually adjusting and keyframing the sizing controls.

Edit Page Keying and Compositing Tools

The Edit page received a significant overhaul of its Compositing tools in this release. There have been many usability improvements and refinements to its compositing features. For more intricate and fine control, you may still want to look to the Fusion page, but simple compositing jobs can be now be done right in the Timeline.

Resolve FX Keying in the Timeline

You can now pull keys directly in the Timeline using the Resolve FX Key filters. These are found in the Resolve FX section of the Open FX category, of the Effects Library. The filter options are 3D Keyer, HSL Keyer, and Luma Keyer, and they are described in detail in the Resolve FX chapter of this guide.

To set up a green screen composite, place your background video on a track underneath your foreground video, and drag the 3D Keyer or HSL Keyer onto the foreground clip.

To adjust the key's parameters, click on the Effects icon in the Inspector to reveal the Keyer's controls, and Select "Open FX Overlay" from the Transform Mode drop-down in the lower-left of the Timeline Viewer, to allow the effect qualifiers to work on the Timeline Viewer.

To pull a Chroma Key in the Timeline using the 3D Keyer.

1	Superimpose your green screened foreground video on a track on top of your background video.

2	Put the Timeline Viewer in Open FX Overlay mode, using the drop-down menu at the lower left of the Viewer. This option allows you to use the effect GUI controls directly on the Viewer.

3 Drag the 3D Keyer from the Effects Library onto the foreground video. The 3D Keyer is a fast and high-quality keyer that's easy to use, drawing strokes to identify the background and foreground of the image you're trying to key.

4 Select the foreground video clip, and open the 3D Keyer from the Effects tab in the Inspector.

5 Click the Pick eye dropper icon in the Controls section, and click and drag across the green screen in the Timeline Viewer. A blue line will show you where you've selected, and the green screen should mostly become transparent.

6 (Optional) Use the Add eye dropper (drawing blue lines), to click and drag over any parts of the green screen that are still not transparent. Use the Subtract eye dropper (drawing red lines) to add back any foreground elements that may have gone transparent by mistake.

7 Turn on the Despill checkbox in the 3D Keyer to remove any green light (spill) that may have reflected onto your foreground subject from the green screen.

Applying the 3D Keyer to the News Anchor clip on the V2 Timeline; note that the "Open FX Overlay" mode on the Viewer is selected (circled), allowing you to use the Inspector Effect Controls in the Viewer

Support for Resolve FX and Open FX Alpha for Track Compositing

DaVinci Resolve 17 now allows the direct use of the Alpha Channel from Resolve FX and Open FX plug-ins for compositing on the Timeline. If an effect creates transparency in the image, a "Use alpha" checkbox appears at the bottom of the effects parameters in the Effects tab of the Inspector. Checking this box immediately applies the alpha channel to the selected clip, compositing it over any background elements that appear in lower tracks. If more than one alpha-modifying effect is applied to a single clip, the alpha channels are mixed together.
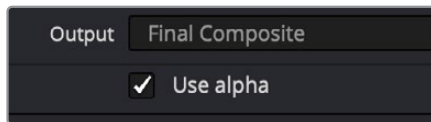
The Use Alpha checkbox at the bottom of the Effects tab in the Inspector

Compositing Alpha Channels on the Timeline

You can now composite tracks directly in the Timeline with clips containing embedded alpha channels. Clips that contain an embedded alpha channel (and whose Alpha mode is turned on in Clip Attributes) will show the proper transparency properties when placed in the Timeline.

Improved Track Compositing Behavior for Differently Sized Clips

Previous versions of DaVinci Resolve had an idiosyncrasy when compositing clips of different sizes. When superimposing a clip that's smaller than the Timeline resolution on top of a larger clip in the Timeline, the rest of the larger clip underneath would not show through unless you cropped or resized the smaller clip on top. In DaVinci Resolve 17, the expected transparency around the edges of the smaller clip now happens automatically.

Burn Away Transition

DaVinci Resolve 17 adds a new Burn Away transition. This transition replicates the visual of a film print burning up in the projector. Use this transition to achieve a classically retro effect, or to strike terror into the hearts of projectionists everywhere. This transition can be found in the Resolve FX Stylize category of the Transitions section of the Open FX category in the Effects Library.

Burn Away transition showing two pirates concerned about the state of their release print

The Burn Away effect has the following parameters:

Progression

This set of controls affects the type of movement the burn takes as it passes through the frame.

- **Motion:** Allows you to pick a type of burning effect. Each option reveals different parameters.
  - **Directional:** The burn moves linearly from one edge of the frame to another. This setting replicates the film being torn away by the take-up reel as it burns. In this mode, the OFX overlay in the Viewer lets you choose the direction.
  - **Hotspots:** The burn erupts from one or more central points. This setting replicates the film jamming in front of a projector bulb and melting away. In this mode, the OFX overlay in the Viewer lets you move the burn points directly in the Viewer.
  - **Path:** Creates a curved path that the burn follows. This setting allows you to specify the burn direction precisely, to account for elements in the frame that you want to burn first. In this mode, the OFX overlay in the Viewer lets you add points to a spline with which to create any curved motion path you want the effect to use.

- **Angle:** (Directional Only) The angle that the burn moves along. You can also change this in the Viewer directly in Open FX Overlay mode.
- **Number of Hotspots:** (Hotspots Only) The number of points that the burn erupts from. The possible values are from 1 to 8.
- **Randomize Hotspots:** (Hotspots Only) Will pick a random distribution of the hotspots in the frame.
- **Number of Points:** (Path Only) The number of points on the onscreen curve control. The range is from 2 to 5. These points can be manipulated directly in the Viewer in Open FX Overlay mode.

Adjust Timing

This set of parameters allows you to control the start and end progression of the burn.

- **Adjust Start:** Adjusts how far along in the transition the effect starts. Values are from -1.000 to 1.000.
- **Adjust End:** Adjusts how far along in the transition the effect ends. Values are from 0.000 to 2.000.

Edge

These controls let you adjust the qualities of the edge of the film as it burns.

- **Raggedness:** How rough the edge of the burn is. Values are from 0.000 (perfectly flat) to 1.000 (extremely rough).
- **Scale:** The scale of the raggedness. Values are from 1.00 to 10.00.

Appearance

These controls adjust the look and color of the burn as it moves through the transition.

- **Melt:** Controls the amount of distortion in the image as it burns away. Values are from 0.000 to 1.000.

- **Char:** Controls the amount of darkened charring along the edge. Values are from 0.000 to 1.000.

- **Char Color:** Lets you select the color of the Char effect.

- **Burn:** Lets you set the thickness of the burn effect. Values are from 0.000 (no burn) to 1.000 (maximum thickness).

- **Burn Hue:** Lets you select the hue of the Burn effect.

- **Burn Sat:** Lets you select the intensity of the color of the Burn effect.

- **Burn Brightness:** Lets you set the brightness of the Burn effect. At lower values, the burning edge assumes a motley, irregular effect. Values are from 0.000 to 1.000.

- **Glow Brightness:** Lets you control the intensity of a glow effect emanating from the Burn effect. Values are from 0.000 to 2.000.

- **Glow Spread:** Lets you control the width of the glow effect. Values are from 0.000 to 2.000.

- **Ash:** Controls how much ash trails behind the burn as it moves through the frame. Values are from 0.000 to 1.000.

- **Ash Color:** The color of the Ash parameter.

Updated Motion-Blurred Transitions

The Barn Door, Push, Slide, and Split transitions have a new Motion Blur parameter to create more organic looking transitions, as if the moving video frames were actually shot using a camera with a shutter. To access this parameter, double click the transition in the Timeline to open the Inspector. The "Motion Blur" slider has values between 0.000 (No Motion Blur) and 1.000 (Maximum Motion Blur).

ITU-R BT.2111-1 Color Bar Generators

DaVinci Resolve now includes a ITU-R BT.2111-1 specification Color Bar Generator for HDR video. These are the color bars to use when calibrating, analyzing, or mastering a Rec.2100 (BT.2100) HDR signal.

These new color bars have saturation levels set at 100% at the top, and 75% in the middle section. They also contain Rec.709 (BT.709) color bars in the lower corners for compatibility with HD SDR signals. Commonly referenced levels are indicated on the image below. The full color bar specification can be found on the ITU's web site: https://www.itu.int/rec/R-REC-BT.2111/en.
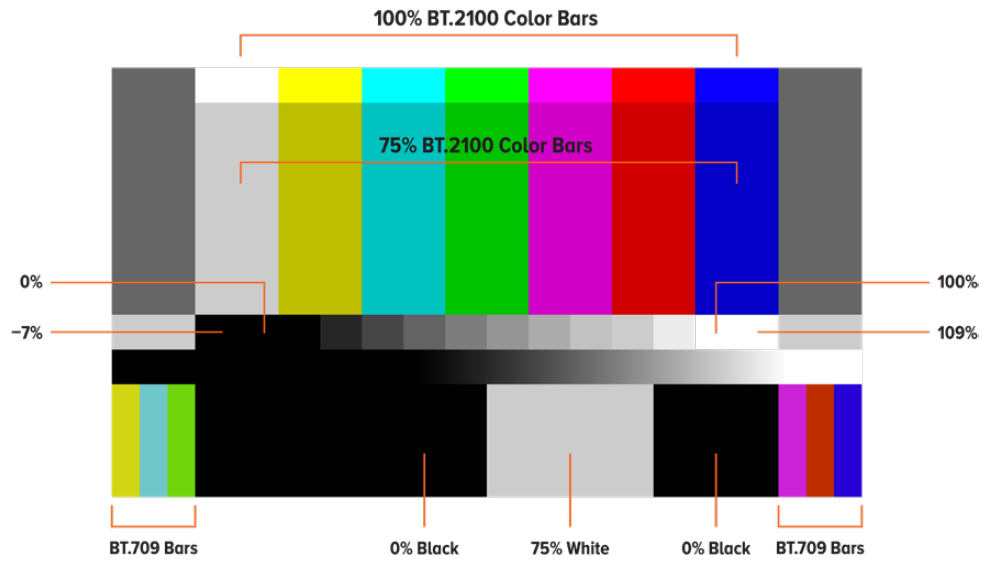
The BT.2111-1 color bars and some of the more commonly used levels
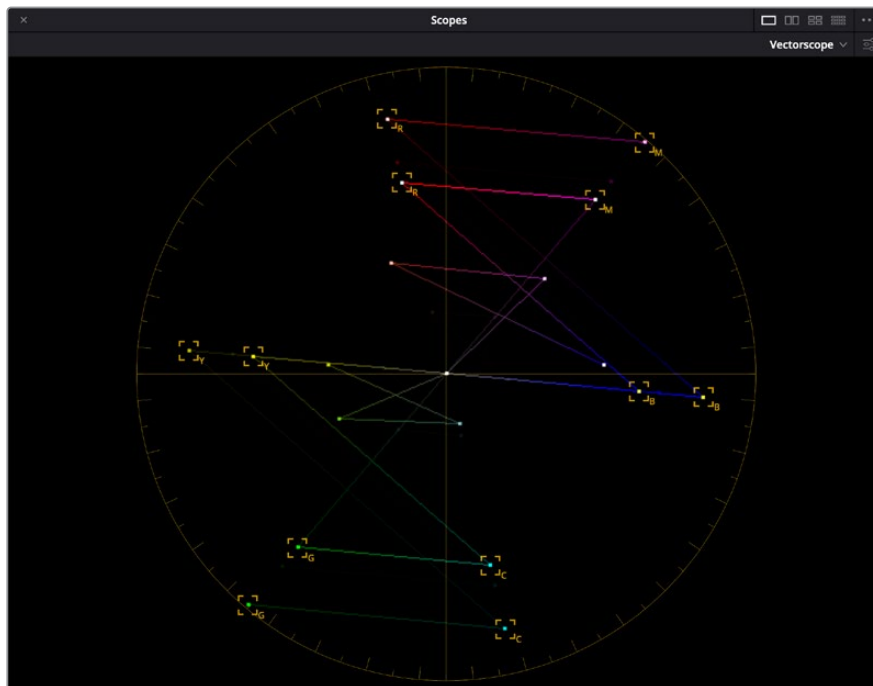
The BT.2111-1 color bars on the Vectorscope, hitting their targets at 100% levels on the outside, 75% levels in the middle, and with the Rec.709 bars represented in the interior

DaVinci Resolve has three different versions of BT.2111-1 color bars, depending on the HDR video EOTF you need.

- **BT.2111 Color Bar HLG Narrow:** Use these bars if your HDR timeline is using a Hybrid Log Gamma curve (HLG). This is most commonly used in broadcast for its simple backward compatibility with SDR televisions.

- **BT.2111 Color Bar PQ Narrow:** Use these bars if your HDR timeline is using a format with a PQ gamma curve (i.e., DolbyVision or HDR10). This is most commonly used for video streaming services and Blu-ray discs..

- **BT.2111 Color Bar PQ Full:** While PQ Full is a part of the Rec.2100 (BT.2100) specification, it is not commonly in use at this time. Use this setting only if you know you need it.

Data Burn-In Enhancements

Data Burn-In has the following enhancements.

Support for Text Opacity in Data Burn-In

As of DaVinci Resolve 17, the actual text of a Data Burn-In can now have variable transparency. Using the Text Opacity slider in the Data Burn-In window you can control the degree of the text's opacity. 0.00 is fully transparent, and 1.00 is fully opaque.

Support for Source Frame Number in Data Burn-In

A new Source Frame Number metadata Burn-In option is now available. If "Source Frame Number" is checked in the Data Burn-In window, the resulting text will display the frame count of the source clip (starting from frame 0), preceded by the "SRC Fm:" prefix render text. For example, SRC Fm: 110.

The new Source Frame Number burn-in, with fully transparent text

Chapter 6

Fusion Improvements

Considerable attention has been given to improving the integration of the Fusion page with the rest of DaVinci Resolve. This includes audio playback, shared markers, and the addition of more GPU-accelerated Resolve FX in the Fusion page. The Fusion page and Fusion Studio gain improvements to the User Interface including a customizable toolbar, Node Editor bookmarks, and new vertical Node Editor layouts.

Contents

General Improvements

The Fusion page in DaVinci Resolve 17 continues to be improved with even tighter integration to the Edit and Cut pages.

Audio Playback and Waveform Display in the Fusion Page

Playing a composition in DaVinci Resolve's Fusion page will play the audio from the Edit or Cut page Timeline. You can choose to hear the sound from all the Timeline audio tracks or the MediaIn node. The audio waveforms are displayed in the Keyframes Editor to assist in the timing of your animations.

Audio with Single-Clip Comps

When you bring a single clip into the Fusion page, playing the Comp will play the audio tracks that are enabled in the Timeline. If the Mute button is enabled on any Timeline tracks, audio from those tracks will not be heard in Fusion.

While compositing in the Fusion page, you can use the speaker icon in the toolbar to mute the audio if you don't need to hear it. The Inspector for the MediaIn node contains a new Audio Tab, where you can choose to solo the audio from the clip or hear all the audio tracks in the Timeline.
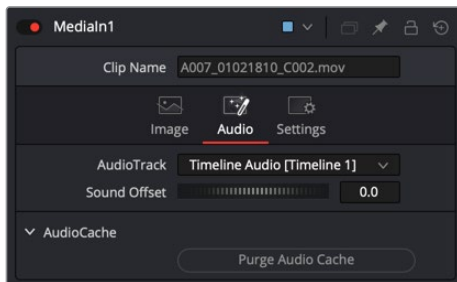
The Audio tab in the MediaIn node is used to select the track for playback, slip the audio timing, and reset the audio cache

If the audio is out of sync when playing back in Fusion, the Audio tab's Sound Offset wheel allows you to slip the audio in subframe frame increments. The slipped audio is only modified in the Fusion page. All other pages retain the original audio placement.

Audio with Media Pool Clips

Audio from a clip brought in through the Media Pool is muted by default. Hearing the audio from a Media Pool clip is a two step process.

To hear audio from a clip brought in through the Media Pool, do the following:

1   Select the clip in the Node Editor.

2   In the Inspector, click the Audio tab and select the clip name from the Audio Track drop-down menu.

3   Right-click the speaker icon in the toolbar, then choose the MediaIn for the Media Pool clip to solo its audio.

You can now use the speaker icon contextual menu to switch back and forth between all the MediaIn nodes.

NOTE: Audio tracks from the Timeline are not heard when using a Fusion Composition effect from the Edit or Cut page.

Purging the Audio Cache

The audio and its settings are cached for faster performance. If you change which audio tracks you want to play back in Fusion, or you use the Sound Offset wheel to slip the audio tracks, you need to purge the audio cache. Also, if you return to the Edit, Cut, or Fairlight page and modify the audio levels, you need to purge the audio cache.

To purge the audio cache after any change to the audio playback:

– Click the Purge Audio Cache button in the Inspector.

The audio will be updated when you next playback the composition.

Using Audio Waveforms

You can display each MediaIn node's audio waveform in the Keyframes Editor and use it as a guide as you add and move keyframes.
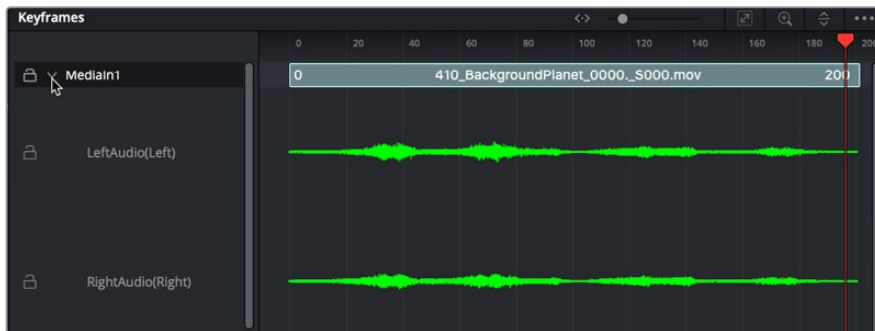
Waveforms are displayed in the Keyframes Editor for all MediaIn nodes

To display the audio waveform in the Keyframes Editor:

1   Open the Keyframes Editor.

2   Click the disclosure arrow next to the MediaIn node to view the audio waveform for that clip.

To change the size of an audio waveform display:

1   Open the Keyframes Editor.

2   In the Keyframes Editor, select the audio track of the waveform you want to modify.

3   Right-click over the audio waveform and choose Line Size > Minimum/Small/Medium/Large/Huge.

TIP: Right-clicking over a track in the Keyframes Editor and choosing All Line Size > Minimum/Small/Medium/Large/Huge changes all the tracks and audio waveforms in the Keyframes Editor.

Audio Playback and Waveform Display in Fusion Studio

The audio functionality is included in Fusion Studio for scratch track (aligning effects to audio and clip timing) purposes. Final renders should almost always be performed without audio. Audio can be heard if it is brought in through a Loader node.

To hear the audio from a specific Loader node:

 - Right-click over the speaker icon and choose the file name that contains the audio you want to hear.

Audio Toolbar button

The Audio button in the toolbar is a toggle that can be used to enable or mute audio play back associated with the clip. Additionally, right clicking this button displays a contextual menu that can be used to select a WAV file, which can be played along with the composition, and to assign an offset to the audio playback.

Using Audio WAV Files

You can also load audio-only files into Fusion Studio. Currently Fusion supports playback of WAV audio files. The entire WAV file is loaded into RAM in order to quickly display the waveform in the Keyframe Editor. That being the case, it is best to use the shortest possible audio file you need for the Comp, so as not to use up more memory than necessary.

> **TIP:** AIFF files can be loaded on macOS.

You can either load the audio file independent of any nodes, or load an audio file into the Saver node. The benefit of using a Saver node to load the audio is that you can view the audio waveforms in the Keyframes Editor.

To load a WAV audio file, do the following:

1 Right-click over the speaker icon and select Choose from the contextual menu.

2 In the file browser window, select the audio WAV file track to be used.

To load a WAV audio file using a Saver node, do the following:

1 Add a Saver node to the Node Editor.

2 In the Inspector, click the Audio tab and click the Browse button.

3 In the file browser window, select the audio WAV file track to be used.

To view the Audio Waveform in Fusion Studio, do the following:

1 Open the Keyframes Editor.

2 Expand the Saver track to view the audio waveform.

When you want to find the precise location of an audio beat, transient, or cue, you can slowly drag over the audio waveform to hear the audio.

To change the size of an audio waveform display:

1 Open the Keyframes Editor.

2 Right-click over the audio waveform and choose Line Size > Minimum/Small/Medium/Large/Huge.

Sound Offset

If the audio is out of sync when playing back in Fusion, the Saver's Audio tab includes a Sound Offset wheel to slip the audio in subframe frame increments.

Shared Markers

In previous releases, Fusion's guides and the Edit/Cut page markers were two different functions performing the same fundamental service. In DaVinci Resolve version 17, guides and markers have been merged.

Markers added to a clip or to the Time Ruler in the Edit page Timeline are displayed in Fusion's Keyframes Editor. Timeline Ruler markers are also displayed in the Spline Editor. Marker names, notes, colors, and durations are also displayed in Fusion.

Markers added to the Time Ruler are editable in Fusion, and the changes appear back in the other DaVinci Resolve pages. Time Ruler markers can be added, moved, deleted, renamed, and given descriptive notes from within Fusion's Keyframes or Spline Editor.

You can open the Guide List to display and modify the Timeline Ruler markers in the Comp.
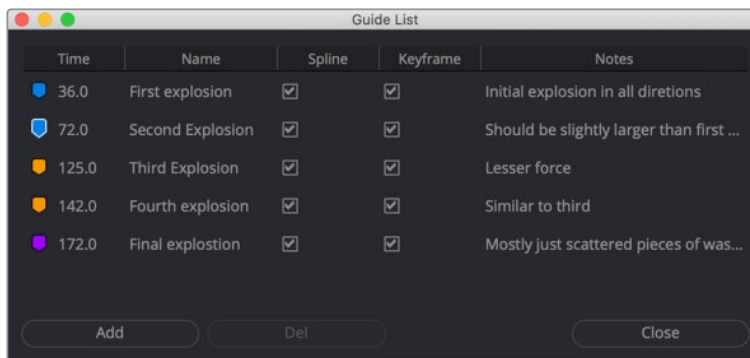
The Guide List is used to view all markers and hide them
from displaying in the Spline or Keyframes Editor

To open the Guide List and see all time ruler markers:

1   Right-click over the Keyframes or Spline Editor's Time Ruler.

2   Choose Show Guide List from the contextual menu, or activate the Keyframes or Spline Editor and press Shift-G

For more information about using Fusion Markers, see Chapter 60, "Animating in Fusion's Keyframes Editor" in the DaVinci Resolve manual and Chapter 9 in the Fusion manual.

NOTE: Markers attached to clips in the Edit page Timeline are visible on MediaIn nodes in Fusion's Keyframes Editor but not editable. They are not visible in the Spline Editor.

New Fusion Page Resolve FX

DaVinci Resolve 17 adds 27 new GPU accelerated Resolve FX to the Fusion page, including the Color page's Noise Reduction and Sharpening tools. The Resolve FX appear in the Open FX category in the Effects Library and can be added to a custom toolbar. These effects work just like other Open FX plug-ins. For more information on each effect's controls, see Part 11, "Resolve FX" in the DaVinci Resolve manual.

Resolve FX Blur

- **Lens Blur:** (Studio Only) Simulates a high-quality optical lens blurring. It offers several technical and creative adjustments over the native Fusion Defocus node.

Resolve FX Color

- **Contrast Pop:** (Studio Only) Applies a sharp high-contrast look, or soft low-contrast look to a selected tonal range.

- **DCTL:** (Studio Only) DCTL files are GPU native, color transformation scripts. Anyone with the mathematical know-how can make and install a DCTL. For more information about DCTLs, see Chapter 174 "Creating DCTL LUTs" in the DaVinci Resolve manual.

- **Dehaze:** (Studio Only) Used to reduce the visible effects of smog, airlight, and haze in an image.

- **False Color:** (Studio Only) Generates user selectable color overlays which can be used to replicate the look of Camera HUDs, thermal/Infrared cameras, and posterization effects.

- **Flicker Addition:** Adds rapidly animated exposure changes to make the image appear to flicker.

Resolve FX Key

- **Alpha Matte Shrink and Grow:** Shrinks and grows the edges of an alpha matte, similar to Fusion's Erode Dilate node.

Resolve FX Light

- **Aperture Diffraction:** (Studio Only) Models the starburst effect usually seen when shooting bright lights with small apertures. Similar to the Highlight node in Fusion, but with much more control.

- **Lens Reflections:** (Studio Only) Simulates intense highlights reflecting off the various optical elements within a lens to create flaring and scattering effects.

Resolve FX Refine

- **Beauty:** (Studio Only) Allows you to selectively smooth detail that falls above a particular threshold, while preserving detail falling below a specific threshold.

Resolve FX Revival

- **Automatic Dirt Removal:** (Studio Only) Uses optical flow to target and repair unwanted artifacts lasting one or two frames, like bits of dust, dirt, and hair.

- **Chromatic Aberration Removal:** (Studio Only) Lets you manually correct color fringing, typically found in high contrast areas.
- **Dead Pixel Fixer:** Repairs dead camera sensor pixels. Now includes new patch shapes, fill methods, and output modes.
- **Deflicker:** (Studio Only) Removes a wide variety of flickering artifacts, including those caused by variable exposure in timelapse clips, fluorescent lighting, and archival film sources.
- **Noise Reduction:** (Studio Only) Provides temporal and spatial noise reduction, previously only available in the Color page.
- **Patch Replacer:** (Studio Only) Offers a quick alternative to the Paint tool when cloning over an unwanted feature in an image.

Resolve FX Sharpen

- **Sharpen:** (Studio Only) Sharpens an image with an enormous amount of control, by applying different amounts of sharpening to the fine, medium, and large structures of the image.
- **Sharpen Edges:** (Studio Only) A variation of the Sharpen filter that's streamlined to limit sharpening to the selected edge details of an image.
- **Soften Sharpen:** (Studio Only) A variation of the Sharpen filter that's streamlined to smooth some details and add sharpness to other details based on small, medium, and large structure sizes.

Resolve FX Stylize

- **Burn Away:** A Transition effect that takes two inputs. The transition simulates the background image burning away to reveal the foreground clip.
- **Pencil Sketch:** (Studio Only) A highly customizable effect used for making an image look like it was hand-drawn.
- **Stylize:** (Studio Only) Applies one of a variety of painterly styles to an image.
- **Tilt-Shift Blur:** (Studio Only) This effect simulates the depth-of-field of a Tilt-Shift lens. An adjustable Z-depth map is used to generate the progressive blur that's applied.

Resolve FX Temporal

- **Motion Trails:** (Studio Only) Like Fusion's Frame Average node, the Motion Trails effect is used to create a ghost-like trail when applied to moving images.
- **Smear:** (Studio Only) Blends frames to create artistic motion blur.

Resolve FX Texture

- **Analog Damage:** (Studio Only) This effect simulates different kinds of television signal degradation resulting from analog transmission and recording.
- **Detail Recovery:** (Studio Only) This effect takes two inputs, typically of the same image. It uses a relief filter applied to one image to add detail back into the other.
- **Film Grain:** (Studio Only) This effect applies a procedurally generated layer of "film grain" over the image. Unlike Fusion's native node, the Resolve FX Film Grain includes presets based on film formats and speed.
- **Texture Pop:** (Studio Only) Texture pop is a frequency-based sharpening/softening effect that divides the image into tonal regions. You can determine how different details are softened or sharpened and then configure how much each tonal region is affected.

Resolve FX Transform

- **Transform:** Almost identical to the native Fusion Transform, however it does include unique interactive on-screen control modes for corner pinning and perspective distortions. The Resolve FX Transform does not concatenate with native Fusion transforms.

- **Video Collage:** Designed to create "video wall" and different split-screen effects, where each MediaIn node appears within a "tile" that can be styled in different ways. Although this node is covered in detail in the Resolve FX section of this document, Fusion-specific setup instructions are covered below.

  There are two ways to set up the Video collage node, which are chosen using the Workflow drop-down menu.

  - **Create Background Workflow mode:** This is perhaps the simplest way to create a split-screen using this effect. This mode creates a frame with masks built into it. These masks can be used to divide a single image or reveal multiple layers of video.

A single image is divided using the masks created from the Video Collage node

The Video Collage node is added to the foreground input on the Merge node. The clips is used as a "background" frame in the collage. The clip that fills the mask holes connects to the Merge node's background input.
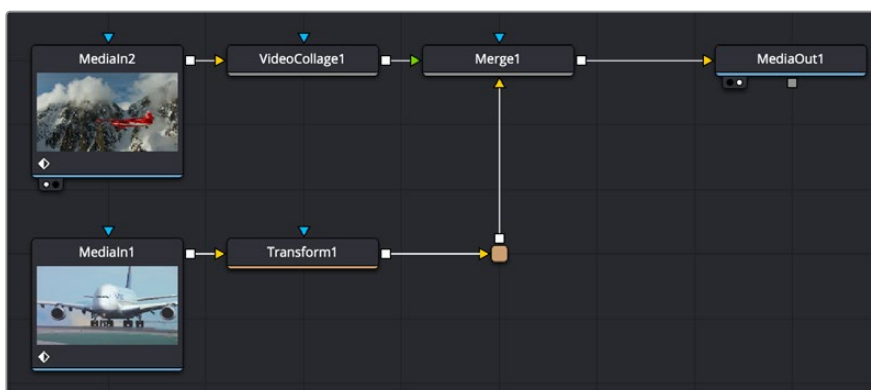
The mask is filled using the background image to the Merge node

A Transform node must be added to each MediaIn node that you want to use to fill the mask holes. The Transform node is used to scale and position each MediaIn correctly within the mask holes. In the example above, the Video Collage effect is applied to the foreground MediaIn 2. The MediaIn 1 node uses a transform node for resizing and connects to the background input.

> **IMPORTANT:** When using Create Background mode, set the Merge node to Subtractive using the Inspector's Subtractive/Additive control.

– **Create Tile Workflow mode:** This mode needs a bit more setup, as it requires you to apply the Video Collage node to each MediaIn that you want to use as a tile in the collage. However, it gives you more options, automatically transforming each MediaIn in your string of Merge nodes to fit a layout you design.

Using Tile mode, multiple MediaIn nodes are assigned to a layout of your own design

The best way to work in Create Tile mode is to connect all the clips you want to be involved in the collage, with a series of Merge nodes, but this time if there's a clip you want to use as the background, it should be the initial background input to the first Merge. Then, apply the Video Collage node to each MediaIn node connected to the foreground inputs of the remaining Merge nodes. These are the MediaIn nodes that will fill the tiles of the collage. On each Video Collage node, choose Create Tile from the Workflow drop-down menu. The MediaIn nodes will fit inside the first rounded tile of the default layout of four tiles.

Ultimately, you'll need to choose which clip goes inside each tile; that's what will create the arrangement. Before you do that, however, you can customize the layout, if desired.
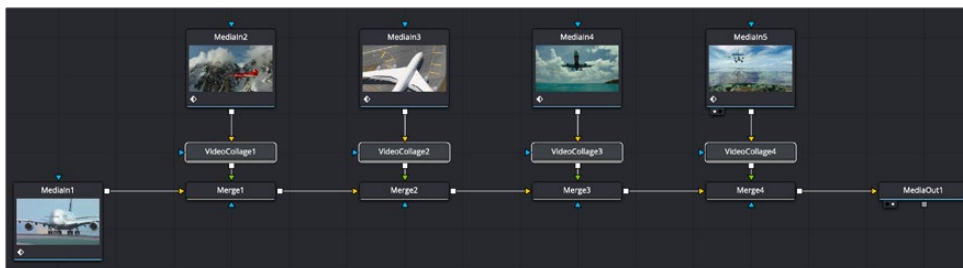
Each MediaIn node is assigned to a tile using the Video Collage node

> **NOTE:** Node Instances cannot be used with the Video Collage node.

You can preview the entire layout by enabling the Preview Layout checkbox in the Inspector. This draws a preview of how all the tiles will be placed. Using this preview and the Layout controls below, you can make whatever changes you want to set things up before copying this plug-in to all the other clips in the tree.

When you decide on a layout, you can make tile specific adjustments by clicking the Tile button and using the Tile controls below.

The Active Tile menu is used to determine which tile you further customize using the Inspector's tile-based controls. You should also note the Active Tile drop-down menu becomes important later on when you apply this effect to multiple MediaIn nodes.

Finally, copy the Video Collage to each MediaIn node and for each copy, select a different tile number from the Active Tile menu. Each MediaIn will be positioned and scaled to fit a different tile location.

More information regarding the animation and other controls in the Video Collage node can be found in the Resolve FX section of this document.

Resolve FX Warp

- **Lens Distort:** (Studio Only) A more straightforward Lens Distort filter than the native Fusion Lens Distort node. It adds the ability to distort the image based on RGB channels.

- **Warper:** (Studio Only) The Warper is a free-form image warper that uses points, rather than a mesh or splines, to push and stretch features in an image as if they were on a sheet of rubber.

Fusion Effect Templates

The integration of Fusion into DaVinci Resolve has enabled the creation of Fusion Titles, Transitions, and Generators for use in the Edit page. In DaVinci Resolve v17, you can now create Fusion Effect templates as well. Like other Fusion templates, you can create Effects on the Fusion page or within Fusion Studio, save the effects as Macros, and then apply them to clips in the Edit page. Fusion Effect templates are essentially Comps created in Fusion that create just about any type of effect on an image (e.g., a rippling water effect, green screen keyer, or a retro 3D video cube). After saving the Macro, you can apply the effect onto any clip in the Edit page Timeline.

Creating a Fusion Effect Template

You start building a Fusion Effect template by bringing a clip from the Edit page Timeline into Fusion. This clip is only used for creating the template and will not be saved with the effect.

Once inside Fusion, you use Fusion's nodes to create the effect you want. You can use a single node or a hundred, depending on the effect you want to create. For instance, using Fusion's Color Correction nodes, you can create a simple color corrector you can use on the Edit page.

To create a simple Color Corrector effect, do the following:

1 Insert the Color Corrector node between the MediaIn and MediaOut nodes.

2 Select the Color Corrector node in the Node Editor, and then press Cmd-A to select the remaining nodes.

3   Right-click over any of the selected node and choose Macro > Create Macros from the contextual menu. Enabling the checkboxes in this window determines the parameters that appear in the Edit page Inspector.

4   The Macro Editor window opens. Here, you can enable the checkboxes for any parameters you want to be shown in the Edit page Inspector.

5   Enter the name of your effects at the top of the Macro Editor window.

6   To save the Macro, click Close at the bottom of the window, then click Yes in the dialog that appears asking you to save the changes.

The Macros must be saved into the correct folder for DaVinci Resolve to recognize the Macro as an effect.

In the save dialog, save the Macro in the following locations:

- **On macOS:** Macintosh HD/Users/username/Library/Application Support/Blackmagic Design/DaVinci Resolve/Fusion/Templates/Edit/Effects

- **On Windows:** C:\Users\username\AppData\Roaming\Blackmagic Design\ DaVinci Resolve\Support\Fusion\Templates\Edit\Effects

- **On Linux:** home/username/.local/share/DaVinciResolve/Fusion/Templates/Edit/Effects

To see the effect in the Edit page Effects Library, you'll need to quit DaVinci Resolve and relaunch the application.

Creating a Fusion Effect Template for Two or More Layers

If the effect you want to create requires multiple images like a video wall, you start by creating a Fusion clip on the Edit page Timeline that includes the number of layers you want the effect to have. The clips are only used to create the number of image inputs for the template and will not be saved with the effect.

Once inside Fusion, use Fusion's nodes to create the effect you want.

Save the Macro following the same steps you use for single clip effects. Enable any of the parameters you want to control in the Edit page. To be able to switch the order of video layers within the effect, make sure you have the Layer checkbox enabled for all the MediaIn nodes.

Once you've saved the Macro and relaunched DaVinci Resolve, to use the effect on multiple timeline layers, you must create a Fusion clip. The Fusion clip should contain the same number of layers the effect requires. The order of the Timeline layers, going from the bottom track to the top, matches the MediaIn numbers. For instance, video track 1 will match the position and appearance of MediaIn1, video track 2 matches MediaIn2 and so on. If you want to change how tracks map to MediaIn nodes, you can change the Layer number in the Inspector, assuming you enabled the MediaIn Layer checkbox when creating the Macro.

Animation Curves Modifier

The Animation Curves Modifier (Anim Curves) is used to dynamically adjust the timing, values, and acceleration of an animation, even if you decide to change the duration of a Comp. Using this Modifier, it becomes infinitely easier to stretch or squish animations, create smooth motion, add bouncing properties, or mirror animations curves without the complexity of manually adjusting splines.

When creating Fusion templates for the Edit and Cut page in DaVinci Resolve, the Anim Curves Modifier allows the keyframed animation you've created in Fusion to stretch and squish appropriately as the transition, title, or effect's duration changes on the Edit & Cut page Timelines.

Curve Shape Controls

The controls for the Anim Curves Modifier appear in the Modifier's tab of the inspector.
The Curve Shape controls determine the acceleration or shape of the animation curve.

- **Source:** This drop-down menu has three options based on how the Comp is created from DaVinci Resolve's Edit page.
  - **Transition:** This setting is automatically selected when the Comp is created from an Edit page transition effect. If the duration of the transition is updated in the Edit page, the timing of the animation updates as well.
  - **Duration:** Use this setting when the Comp is created from a clip on the Edit page. The animation timing will update if the clip's duration changes by trimming.
  - **Custom:** Displays an Input dial to manually control the timing.

- **Input:** This dial is only visible when Source is set to Custom. It is used to change the input keyframe value.

- **Curve:** The Curve drop-down menu selects the interpolation method used between keyframes. The three choices are linear, easing, or custom.
  - **Linear:** The default linear interpolation method maintains a fixed, consistent acceleration between keyframes.
  - **Easing:** Displays interpolation menus for both the start of the curve (In) and the end of the curve (Out).
  - **Custom:** Opens a mini Spline Editor to customize the interpolation from the start of the animation to the end.

- **Mirror:** Plays the animation forward, and after reaching the end, it returns to the starting value. This causes the initial animation to be twice as fast since the second half of the Comp is used for the reverse animation.

- **Invert:** Flips the animation curve upside-down, so that the values start high and end low.

Scaling

The Scale parameters modify the animation values using relative adjustments.

- **Scale:** This number is a multiplier applied to the value of the keyframes. If the Scale value is 2 and a keyframe has a value of 0, it remains 0. If the Scale value is 2 and a keyframe has a value of 10, the result is as if the keyframe is set to 20. This can be thought of as the ending value for the animation. It is best to set this while viewing the last frame in the comp.

- **Offset:** The offset is added to the keyframe values and can be thought of as the starting value for the animation. It is best to set this while viewing the first frame in the comp.

- **Clip Low:** Ensures the output value never dips below 0.0.

- **Clip High:** Ensures the output value never exceeds 1.0.

Timing

The Timing parameters adjust the animation timing using relative values.

- **Time Scale:** Stretches or squishes the animation, causing it to run faster or slower. A value of 1.0 keeps the animation running for the Comp's duration (unless you have customized the animation using other controls in the Modifier).

- **Time Offset:** This value delays the animation, as a fraction of its total duration. A value of 0.0 applies no delay. A value of 0.5 delays the animation starting point midway into the Comp's duration.

Using the Anim Curves Modifier to Create a Custom Transition

To understand how to use the Anim Curves Modifier for a transition, let's create a simple scaling dissolve.

1   Add a standard cross dissolve in the Edit page Timeline.

2   Right-click over the transition and choose Convert to Fusion Cross Dissolve.

3   Right-click over the transition again and choose Open in Fusion page.

4   Add a Transform node to MediaIn1 and to MediaIn 2.

5   Select the Transform node attached to the MediaIn 2.

6   In the Inspector, right-click the Size control, then choose Modify With > Anim Curves from the contextual menu. Adding this modifier to the Size control will cause the slider to animate from 0 to 1 for the Cross Dissolve's duration.

7   Select the Transform node attached to the MediaIn 1.

8   In the Inspector, right-click the Size control, then choose Modify With > Anim Curves from the contextual menu.

9   At the top of the Inspector, click the Modifier tab and click the Invert button. Inverting the animation curves causes MediaIn1 to scale opposite of MediaIn 2.

10 In the Modifiers tab, set the Curve drop-down menu to Easing, and experiment with the different ease-in ease-out curve types from the In/Out drop-down menus.

Once you create a Macro from this Node Tree and save it as a Transition template, you can apply it in the Edit page Timeline. If you change the transition duration in the Edit page, the animation timing will update appropriately.

Using the Anim Curves Modifier with Paths

To understand how to use the Anim Curves Modifier's with a path modifier, let's use the premise that you want to create text that falls from the top of the frame and bounces as it reaches the bottom of the frame.

1   In Fusion, create two keyframes that cause text to start at the top of the frame and drop to the bottom. This automatically creates a Path Modifier.

2   In the Inspector's Modifier tab, right-click over the Displacement parameter and choose Insert > Anim Curves. The animation is normalized to the duration of the Comp.

3   Set the Source menu to Duration since this is not a transition, and we are not customizing the duration.

4   From the Curve menu, choose Easing, then for the Out menu, choose Bounce.

5   Play the animation to see the Bounce animation.

6   To make the bounce occur halfway down the frame, change the Scale to .05.

7   To make the animation run twice as fast, enter 2.0 in the Time Scale parameter.

Once you create a Macro from this Node Tree and save it as a Title template, you can apply it in the Edit page Timeline. If you change the Title's duration in the Edit page, the animation timing will update appropriately.

> **TIP:** To view the resulting animation curve in the Spline Editor, select the parameter name in the Spline Editor's header. The spline is updated as you change the controls.

Shape Nodes

Fusion includes several vector Shape nodes that can be used to create animated graphical elements in motion design projects. Shapes are located in the Shape category of the Effects Library, and all the nodes begin with an s to differentiate them from other similarly named general-purpose nodes. There are various types of shape nodes, including:

- **Generators:** sEllipse, sNgon, sRectangle, sStar
- **Multipliers:** sDuplicate. sGrid
- **Modifiers:** sExpand, sJitter, sOffset, sOutline, sTransform
- **Combiners:** sBoolean, sMerge
- **Render node:** sRender

To begin using Shape nodes, you start with one of the basic shapes, like sEllipse, sRectangle, sNGon, or sStar, and then connect it to a sRender node. Technically, the shape nodes are descriptions of the vector shapes, while the sRender node is responsible for rendering the shapes in the defined frame size. That being the case, only the sRender node is viewable. You can connect multiple shape nodes to create intricate designs, but any string of shape nodes must always end with a sRender node. The sRender node can then be connected to larger node trees for further compositing. The remaining Shape nodes modify the basic shapes to create more complex compound shapes.
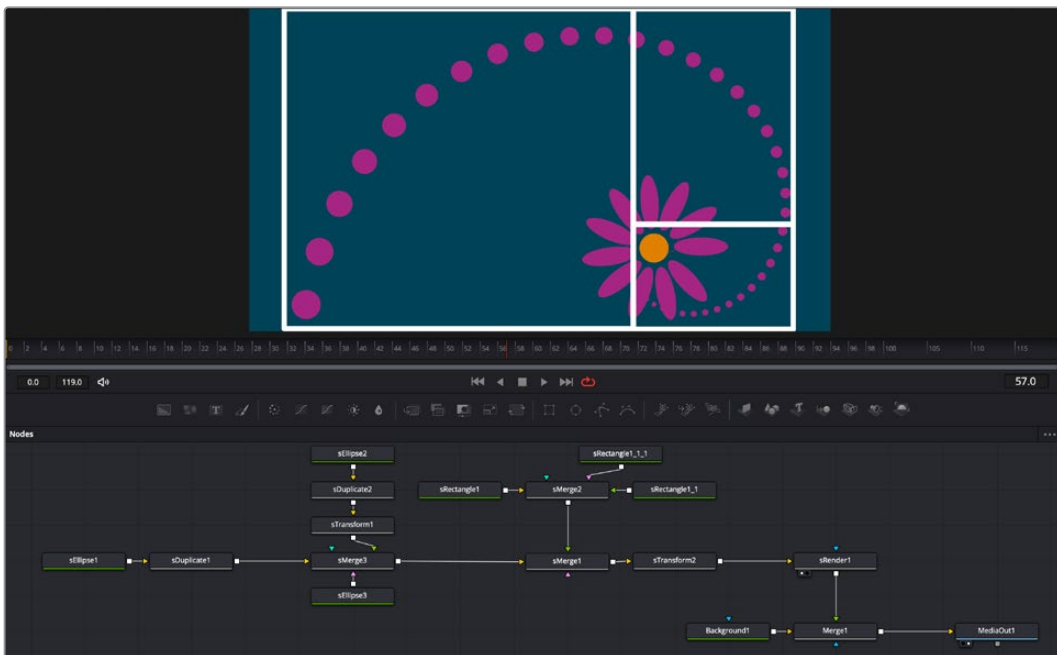
Shapes are used to create repetitive patterns with offsets.

Below is a list of the shape nodes with a brief description of each:

- **sBoolean:** Combines two shapes based on boolean operators, including Intersection, Union, Subtract, and Xor. The color of each shape is either used or replaced based on the Style mode menu.
- **sDuplicate:** Creates a user-defined number of copies of the connected shape. The copies can be offset in position, size, and rotation.
- **sEllipse:** Creates a circular shape that can be color filled or displayed as an outline. When the Solid checkbox is disabled, the Border Width modifies the thickness of the outline.

- **sExpand:** Similar to the border width parameter in the sEllipse, sRectangle, sStar, and sNGon shapes, the Amount slider in the sExpand node grows the width of shape outlines. This node can be used after a sMerge or sBoolean to expand the width of multiple shapes simultaneously.

- **sGrid:** Creates a 3x3 grid of the shape connected to the input. The size of the grid can be expanded using the Grid Cells X and Y controls. The X and Y Offsets determine the spread between the cells in the grid.

- **sJitter:** Jitter has two modes; the Fixed mode is used to offset the different copies of shapes generated by a sBoolean, sGrid, sDuplicate node, or any group of nodes combined in the sMerge node. Setting the Jitter mode to Random auto-animates each jitter parameter. The animation of each parameter Is limited to the values defined by each parameter's range control.

- **sMerge:** Used to combine multiple shape nodes. You can connect as many shapes nodes into the sMerge, and each new shape node you connect will be the front-most shape in the layer order.

- **sNGon:** Creates a shape with a variable number of sides that can be color filled or displayed as an outline. When the Solid checkbox is disabled, the Border Width modifies the thickness of the outline.

- **sOffset:** The vectors of the shape are scaled, divided, and moved horizontally and vertically.

- **sOutline:** Although each basic shape can be rendered as an outline, the sOutline node can create outlines from sBoolean or sMerge node results.

- **sRectangle:** Creates a rectangular shape that can be color filled or displayed as an outline. When the Solid checkbox is disabled, the Border Width modifies the thickness of the outline.

- **sRender:** The sRender node converts the shape vectors to an image. Controls in the sRender node define the frame size and motion blur rendering.

- **sStar:** Creates a star shape where you can define the number of points on the star. When the Solid checkbox is disabled, the star is displayed as an outline, and the Border Width modifies the thickness of the outline.

- **sTransform:** The sTransform node can be used for simple 2D Transformations of shapes, such as moving, rotating, and scaling.

Advanced Optical Flow Processing

The Optical Flow, Repair Frame, and Tween nodes include a faster GPU-based Optical Flow algorithm. When you add the Optical Flow, Repair Frame, or Tween node to a Comp, the Inspector now includes a Method drop-down menu where you can choose Advanced to enable the GPU-based algorithm. This Advanced method is the same Optical Flow algorithm used in other DaVinci Resolve pages.

By choosing Classic from the Method drop-down menu in the Inspector, you can use the older CPU-based algorithm to maintain compatibility with Comps created in previous versions. This method may also be better suited for some Stereo3D processing.

Convert Standard Transitions into Fusion Cross Dissolves

You can convert any transition in the Edit page into a Fusion Cross Dissolve. Once you apply a transition from the Edit page Effect Library, you can right-click over it and choose Convert to Fusion Cross Dissolve. The transition is converted into a cross dissolve, which you can then customize in Fusion by right-clicking on it to choose Open in Fusion page from the contextual menu. The transition is displayed in Fusion's Node Editor with the two MediaIn nodes and a Dissolve node. Using any of Fusion's other nodes, you can create any transition effect to replace the cross dissolve. After making your changes, switching back to the Edit page automatically updates the transition effect in the Timeline. The custom transition can be saved as a Transition Preset in the Edit page and used in other projects.

Improvements to the Interface

Fusion has several updates to the User Interface that make it quick to jump to specific locations in a node tree, access commonly used tools faster, and customize the layout with more flexibility.

Node View Bookmarks

Bookmarks save the position and scale of the Node Editor, so you can quickly and precisely jump from viewing one group of nodes to viewing another.

To add a bookmark, do the following:

1   Pan and scale in the Node Editor to view a group of nodes you are interested in.

2   From the Options menu in the upper right of the Node Editor, choose Add Bookmark, or press Cmd-D.

3   In the Manage Bookmarks dialog that opens, enter a name for the bookmark and click the Add button.

The first nine saved bookmarks are given keyboard shortcuts and listed in the Options menu. They are also listed in the Go To Bookmarks dialog along with any saved bookmarks beyond the initial nine.
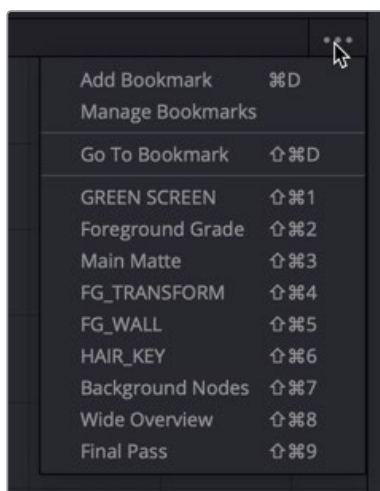
The Node Editor Options menu with nine bookmarks added

> **TIP:** You can return the Node Editor to the default scale by right-clicking in the Node Editor and choosing Scale > Default Scale or pressing Cmd-1.

If your Node Tree changes and you want to update Bookmark names or delete bookmarks, those tasks can be done in the Manage Bookmarks dialog.

To rename or delete a bookmark, do the following:
1   From the Options menu in the upper right of the Node Editor, choose Manage Bookmarks.
2   In the Manage Bookmarks dialog that opens, right-click over the bookmark and choose Rename or Remove.
3   Click OK to close the Manage Bookmarks dialog.

Using Bookmarks

You can jump to a Bookmark view by selecting a bookmark listed in the Options menu or choosing Go To Bookmarks to open the Go To Bookmarks dialog. The Go To Bookmarks dialog has all the bookmarks listed in the order they were created in the current composition. Double clicking on any entry in the dialog will update the Node Editor to that view and close the Go To Bookmarks dialog.

If you have a long list of bookmarks, you can use the search field at the bottom of the dialog to enter the name of the bookmark you want to find.

Changing the Sort Order and Assigning Keyboard Shortcuts

Bookmarks appear in the Options menu and in the Go To Bookmarks dialog in the order they were created. The top nine bookmarks listed are assigned keyboard short cuts. If you want to change the sort order of the list you can do that in the Manage Bookmarks dialog. This can be useful if you want some bookmarks to have specific keyboard shortcuts, or you want a bookmark you made early in the process to not have a keyboard shortcut assigned to it.

To change the order of the listed bookmarks, do the following:
1   From the Options menu in the upper right of the Node Editor, choose Manage Bookmarks.
2   In the Manage Bookmarks dialog drag a bookmark up or down in the list.
3   An insert line appears where the bookmark will be inserted. Release the mouse button when the insert line is where you want the bookmark to be listed.

The keyboard short cuts will update to reflect the new order.

> **TIP:** You can hold down the Shift key to select multiple bookmarks and move them simultaneously up or down in the Manage Bookmark list.

Using Underlays as Bookmarks

Underlays added to the Node Editor are automatically added as bookmarks. They are listed in the Options menu below the list of your custom bookmarks. You can omit Underlays from showing in the list of bookmarks by opening the Go To Bookmarks dialog and disabling the checkbox to Show Underlays. When the checkbox is disabled, Underlays will not show in the Go To Bookmarks dialog, and they will not appear in the Options menu.

Customizable Toolbar

You can add and remove tools from the Fusion toolbar and then save the custom toolbar as a preset. New tools can be added by dragging them from the Effects library or the Node Editor, and dividers can be added to group tool sets together.

To create a new toolbar, do the following:

1   Right click in an empty area of the toolbar and choose Customize > Create Toolbar from the contextual menu.

2   Enter a name for the toolbar in the dialog box, and click OK.

To rearrange the tools in the toolbar, do the following:

1   Create a new custom toolbar or select an existing custom toolbar.

2   Drag a node in the toolbar to a new location.

To add a tool to the toolbar:

1   Create a new custom toolbar or select an existing custom toolbar

2   Do one of the following:

  − Drag a node from the Effects Library to the location on the toolbar where you want it added.

  − Drag a node from the Node Editor to the location on the toolbar where you want it added.

To add a divider to a toolbar, do the following:

1   Create a new custom toolbar or select an existing custom toolbar.

2   Right-click over any tool and choose Customize > Add Divider. A divider is added to the right of the tool.

To remove a tool from a toolbar, do the following:

1   Create a new custom toolbar or select an existing custom toolbar.

2   Right-click over any tool and choose Remove [name of tool].

To remove a group of tools between two dividers, do the following:

1   Create a new custom toolbar or select an existing custom toolbar.

2   Right-click over any tool in a group and choose Remove Group.

To prevent a custom toolbar from being modified:

Right-click over the toolbar and choose Lock from the contextual menu.

To switch between toolbars:

Right-click over the toolbar and choose the custom toolbar name or choose Default to return to Fusion's default toolbar.

To delete a custom toolbar, do the following:

1   Right-click over the toolbar and choose the name of the custom toolbar you want to delete.

2   Right-click over the toolbar again and choose Customize > Remove [toolbar name]

Vertical Node Editor Layouts

Two new Fusion Layout presets in Workspace > Layout Presets allow for positioning the Node Editor vertically, either alongside the Inspector, or along the left side of the screen. This can be very helpful when animating in the Spline Editor or Keyframes Editor.

In either layout, the node tree can flow from top to bottom, leaving much more room along the lower half of the screen for the Spline Editor or Keyframes Editor.
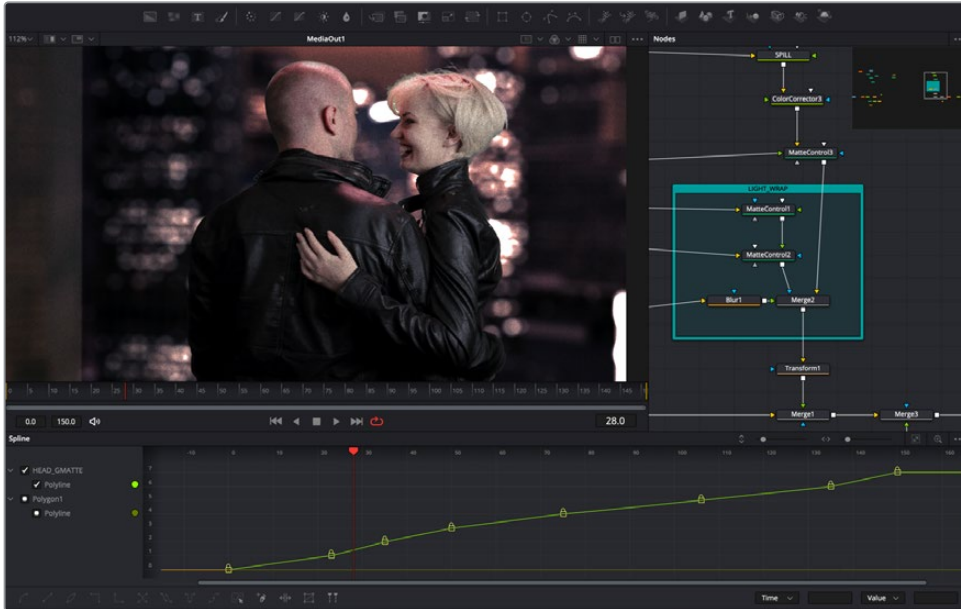
The Mid Flow Vertical layout preset used with the vertical flow direction setting

When using the new vertical layouts, enabling the Flow > Vertical Build Direction option in the Fusion settings will cause all new Node Trees to build vertically, leaving maximum room for Fusion's animation tools.

You can then save alternative layouts based on these two vertical presets using the Workspace > Layout Presets submenu.

When you want to return to the default horizontal Node Editor layout, just choose Workspace > Layout Presets > Fusion Presets > Default.Onscreen Controls for Fusion Templates on the Edit Page

Fusion templates added to the Timeline in the Edit page now show the onscreen controls for Position, Rotation, and Gradient Angles, just as they would show in the Fusion page. By enabling OFX Viewer overlays, onscreen controls can be used for modifying parameters in a Fusion title, Generator, Effect, or Transition template.

Improvements to Text and Font Size Management

When using non-Latin characters, including Hebrew or Arabic script, in Text+ and Text3D nodes, ligature groups (connected characters) are handled with more accuracy.

Automatic Fusion Comp Creation in DaVinci Resolve

When you switch to the Fusion page from an empty Timeline, adding a node or a clip from the Media Pool will automatically add a MediaOut node and create a Fusion Composition effect in the Timeline.

Chapter 7

Color Page Improvements

DaVinci Resolve 17 introduces some truly consequential new features to the Color page, such as the next generation of Resolve Color Management, and the all new HDR palette, Color Warper, and Magic Mask palettes, all of which may change how you approach grading overall. However, it also includes an impressive list of smaller improvements, including a Sat vs Lum curve, custom LUT paths, and split screen display of multiple playheads. No matter how you work, there will be something new to like.

Contents

Updated Resolve Color Management

DaVinci Resolve 17 introduces the biggest improvements to Resolve Color Management (RCM) since it was originally introduced, adding numerous features to simplify setup, improve image quality, and make the "feel" of your grading controls more consistent. Specific improvements include improved metadata management for incoming media files that support color metadata, a new wide gamut color space suitable for using as your default Timeline working color space for any program, a new Input Tone Mapping option (Input DRT) that makes it easier to mix media formats for SDR and HDR grading, improved Timeline to Output Tone Mapping (Output DRT) that offers improved shadow and highlight handling, and select color space-aware grading palettes that make controls feel and perform well no matter what you're grading.

Simplified RCM Setup

One of the biggest color management improvements for many DaVinci Resolve users will be the simplified presets that let you configure RCM with a single menu selection. Many of the new color management features that have been added to version 17 are intended to enable better visual results while using its new default settings. This being the case, no matter what your level of expertise, you can now enable the full benefits of RCM with only two drop-down menus.

When you first choose DaVinci YRGB Color Managed from the Color science drop-down menu of the Color Management panel in the Project Settings, you're presented with a simple pair of menus for setting up how you want to work with Resolve Color Management. The "Resolve color management preset," and the "Output Color Space."
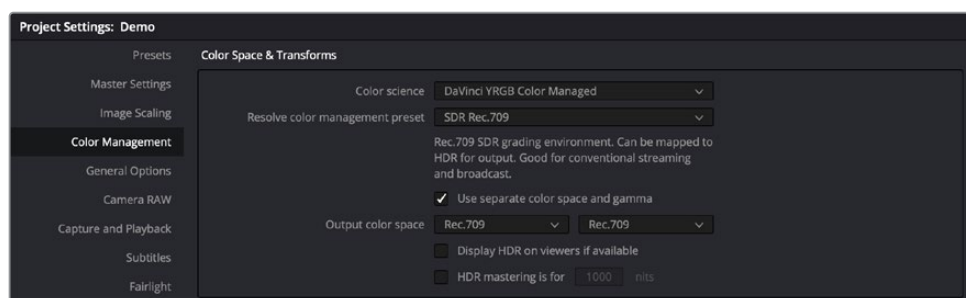
Resolve Color Management presets for fast, simple color management setup

Resolve Color Management Presets

The Resolve Color Management preset menu lets you choose how you want to use RCM to grade your program. Each of these presets fully configures your project's use of color management, and the setting you select directly impacts how you'll grade your program. Because of this, once you choose a method of working and you grade every clip in your program, those grades rely on the preset you used being selected in order to appear as they should.

When it comes to choosing a preset, a good way to think about which to use is to choose an SDR or HDR preset that corresponds to the primary deliverable you plan on outputting. Both SDR and HDR presets have several variations that you can choose among.

While these presets correlate to how you plan on outputting your program, they don't lock you in, since you can always change the Output Color Space (described below). This makes it possible to export multiple versions of your program, each intended for different venues, no matter which color management preset you're using.

Whenever you choose a preset, a brief description explains the workflow that preset is intended to facilitate. Here's a list of the available presets, with slightly more detailed explanations.

- **SDR Rec.709:** (default) Sets up a Rec.709 SDR grading environment. Your work can be converted to HDR on output, if specified, but is limited to a Rec.709 gamut with out-of-bounds colors being clipped. Gamma 2.4 is not mentioned in the name because scene versus display OOTF is managed automatically. Suitable for conventional streaming and broadcast.

- **SDR P3 Broadcast:** Sets up a P3-D65 SDR grading environment. Your work can be mapped to HDR for output, if specified, but is limited to a P3-D65 gamut with out-of-bounds colors being clipped. Gamma 2.4 is not mentioned in the name because scene versus display OOTF is managed automatically. Suitable for wider gamut streaming and broadcast at SDR levels.

- **SDR P3 Cinema:** Sets up a P3-D60 SDR grading environment. Your work can be mapped to HDR for output, if specified, but is limited to a P3-D60 gamut with out-of-bounds colors being clipped. Suitable for conventional Cinema projection.

- **SDR Rec.2020:** Sets up a Rec.2020 SDR grading environment. Your work can be mapped to HDR for output, if specified. Good for wide gamut streaming and broadcast.

- **DaVinci Wide Gamut:** Sets up an extra wide gamut grading environment that's suitable for grading either SDR or HDR. Capable of exporting with maximum image fidelity, preserving highlight details of up to 10,000 nits. This is a log-encoded grading space, for colorists wishing to work that way. Suitable for creating mezzanine intermediates or final deliverables, or for grading HDR with high nit levels.

- **HDR P3 Broadcast:** Sets up a P3-D65 HDR grading environment. Output gamut is limited to P3-D65, with out-of-bounds colors being clipped. Suitable for grading wide gamut SDR or HDR up to 1000 nits.

- **HDR Rec.2020:** Sets up a Rec.2020 HDR grading environment. Suitable for wide gamut SDR or HDR deliverables up to 1000 nits.

- **Custom:** If none of the available presets suits how you need to work, you can choose Custom, which exposes the full set of RCM settings for you to set up to suit your needs.

> **IMPORTANT**
>
> For all presets, importing media that's in an identical or smaller gamut maps the image data into the larger color space of the preset without transforming it. Importing media with a wider gamut than the color space of the preset remaps the image data to fit into the smaller color space, while preserving as much image detail as possible.

Output Color Space

For most DaVinci Resolve installations and projects, you'll set your Output Color Space to match the needs of your program, according to your display's capabilities (or the capabilities your display is set to use for the project at hand). You'll also typically use a Resolve Color Management preset that matches those capabilities.

However, RCM gives you the flexibility of grading in one color space and then outputting to others, when necessary. For example, it's easy to grade an SDR Rec.709 version of a program for streaming or broadcast, and then switch the Output Color Space to SDR P3 Cinema to output an additional deliverable for theatrical exhibition.

To facilitate this, you can set the Output Color Space to any setting, independent of the Resolve Color Management preset you've selected, and DaVinci Resolve will automatically convert from your Color Management Preset to the Output Color Space of your choice. When you do so, here are the rules that govern the resulting image transform.

When going SDR to HDR:
- 0-50 nits (18% mid-gray) in your program is mapped to 0-50 nits on output (no change)
- Everything from 51-90 nits in your program is remapped from 51 to 100 nits (slightly expanded)
- Everything from 91-100 nits in your program is remapped from 101 to 1000 nits (greatly expanded)
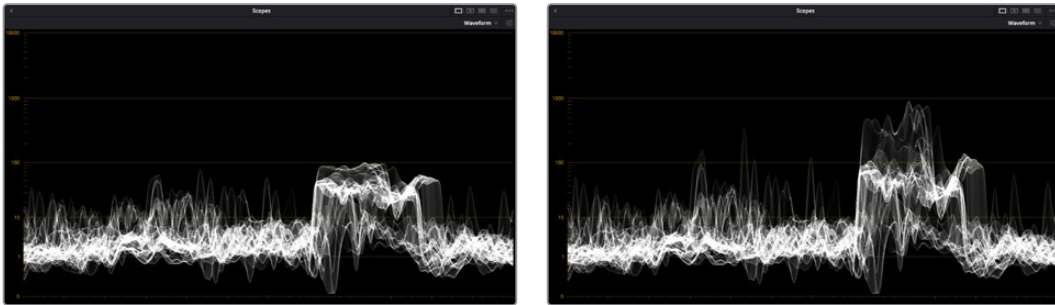
(Left) Original SDR grade seen within an HDR scale, (Right) After an automatic SDR to HDR conversion

When going from HDR to SDR, the reverse is done:
- 0-50 nits (18% mid-gray) in your program is mapped to 0-50 nits on output (no change)
- Everything from 51 to 100 nits in your program is remapped from 51-90 nits (slightly compressed)
- Everything from 101 to 1000 nits in your program is remapped from 91-100 nits (greatly compressed)

While these methods of converting between SDR and HDR provide an effective starting point for conversion, they're not meant to be an automatic solution. It's critical that you do a trim pass whenever outputting a deliverable in a new color space and EOTF, so you can check every clip and make adjustments to improve the result when necessary.

> **NOTE:** When converting SDR to HDR, this behavior may exaggerate noise in imported SDR media that happens to have large flat expanses of bright colors. If you see particular clips that show this issue, you can disable this behavior on a clip by clip basis in the Media Pool clip contextual menu, or the Thumbnail Timeline contextual menu in the Color page, by toggling "Inverse DRT for SDR to HDR Conversion."

Advanced RCM Setup

Advanced users who need more detailed control over every aspect of RCM can choose Custom from the Resolve Color Management preset menu. This exposes every control that's available, which opens a world of workflow possibilities for advanced users and post production facilities.
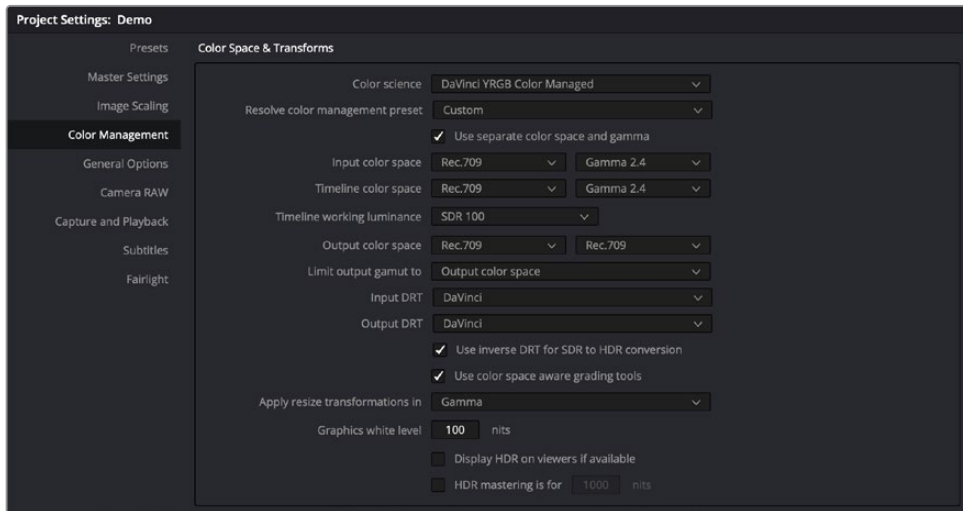
Custom Color Management settings of Resolve Color Management as updated in DaVinci Resolve 17

NOTE: Older projects using RCM will have Color science set to Legacy, to preserve the older color management settings and color transformations effect on your work. For more information on how the previous generation of RCM works, see the September 2020 version of the DaVinci Resolve 16 Manual.

Improved Metadata Management

When enabled, RCM better identifies the color space information of imported media that's been either transcoded or recorded directly to supported non-raw media formats, reading the NCLC metadata of QuickTime-wrapped files, the color space metadata of .mxf-wrapped files, and the XML sidecar files that track color management in ACES workflows. This behavior is automatic; there are no visible controls governing this behavior aside from the individual Input Color Space and Input Gamma settings associated with each clip in the Media Pool.

Color Space Metadata in QuickTime

DaVinci Resolve is capable of reading the NCLC metadata found within media files wrapped within a QuickTime container for proper color management. This metadata consists of three values formatted as (for example) 1-1-1. From left to right, these three digits specify the Color Primary (or color space), Transfer Function (or gamma), and Color Matrix used by that media file.

These values are standardized in the SMPTE Registered Disclosure Document RDD 36:2015. For your information, the different codes are listed in the following table. In the previous example, the code of 1-1-1 indicates a standard dynamic range clip that uses the BT.709 primaries, transfer function, and color matrix.

Color Primary		Transfer Function		Color Matrix	
0	Reserved	0	Reserved	0	GBR
1	ITU-R BT.709	1	ITU-R BT.709	1	BT709
2	Unspecified	2	Unspecified	2	Unspecified
3	Reserved	3	Reserved	3	Reserved
4	ITU-R BT.470M	4	Gamma 2.2 curve	4	FCC
5	ITU-R BT.470BG	5	Gamma 2.8 curve	5	BT470BG
6	SMPTE 170M	6	SMPTE 170M	6	SMPTE 170M
7	SMPTE 240M	7	SMPTE 240M	7	SMPTE 240M
8	FILM	8	Linear	8	YCOCG
9	ITU-R BT.2020	9	Log	9	BT2020 Non-constant Luminance
10	SMPTE ST 428-1	10	Log Sqrt	10	BT2020 Constant Luminance
11	DCI P3	11	IEC 61966-2-4	–	–
12	P3 D65	12	ITU-R BT.1361 Extended Colour Gamut	–	–
–	–	13	IEC 61966-2-1	–	–
–	–	14	ITU-R BT.2020 10 bit	–	–
–	–	15	ITU-R BT.2020 12 bit	–	–
–	–	16	SMPTE ST 2084 (PQ)	–	–
–	–	17	SMPTE ST 428-1	–	–
–	–	18	ARIB STD-B67 (HLG)	–	–

Ability to Bypass Color Management Per Clip

When you right-click a clip in the Thumbnail Timeline of the Color page, a "Bypass Color Management" setting appears underneath the Input Color Space and Input Gamma submenus that let you identify a clip's color characteristics. Choosing this option so that it appears checked lets you exclude that clip from color management altogether, in the event you want to manually manage that clip using LUTs, the Color Space Transform node, or simply by doing manual grading.
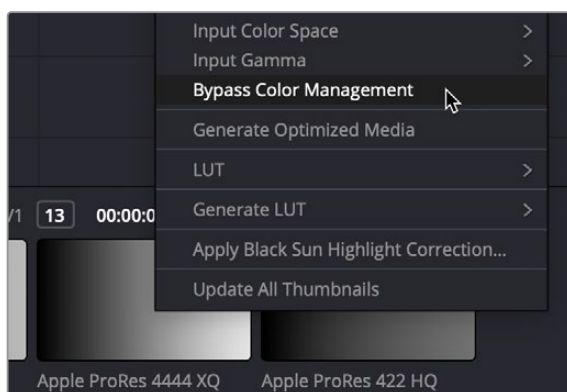
The Bypass Color Management option for clips in the contextual menu of the Thumbnail Timeline

DaVinci Wide Gamut Color Space and DaVinci Intermediate Gamma

DaVinci Wide Gamut (DaVinci WG) and DaVinci Intermediate are Timeline Color Space and Gamma settings that provide a reliable universal internal working color space, which encompasses a practical maximum of what image data any given camera can capture. The DaVinci Wide Gamut color space is greater than BT.2020, ARRI Wide Gamut, and even ACES, so you don't ever lose image data no matter where your media is coming from.

Furthermore, the primary color values of the DaVinci WG color space are set such that the process of automatically mapping source media from different cameras into this gamut is extremely accurate as part of the Input to Timeline Color Space conversion, and tone and saturation mapping from one color space to another can be done more accurately in the Timeline to Output Color Space conversion. This also helps to produce greater consistency among media from different cameras when making manual grading adjustments (though some variations due to differences in camera and lens systems will remain).
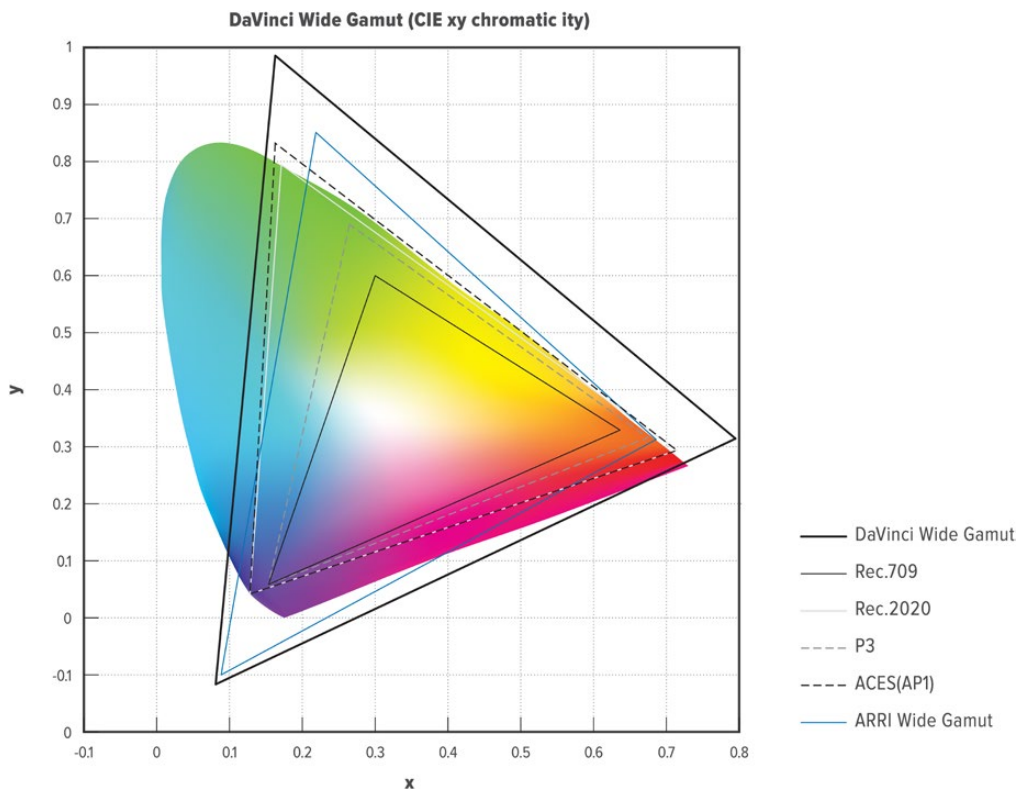
(Left) The DaVinci Wide Gamut color space; (Right) The DaVinci Intermediate OETF

The DaVinci Intermediate OETF gamma setting has been designed to work with DaVinci Wide Gamut to provide a suitable internal luminance mapping of high precision image data, in preparation for mastering to either HDR or SDR standards, as your needs require, without losing image data.
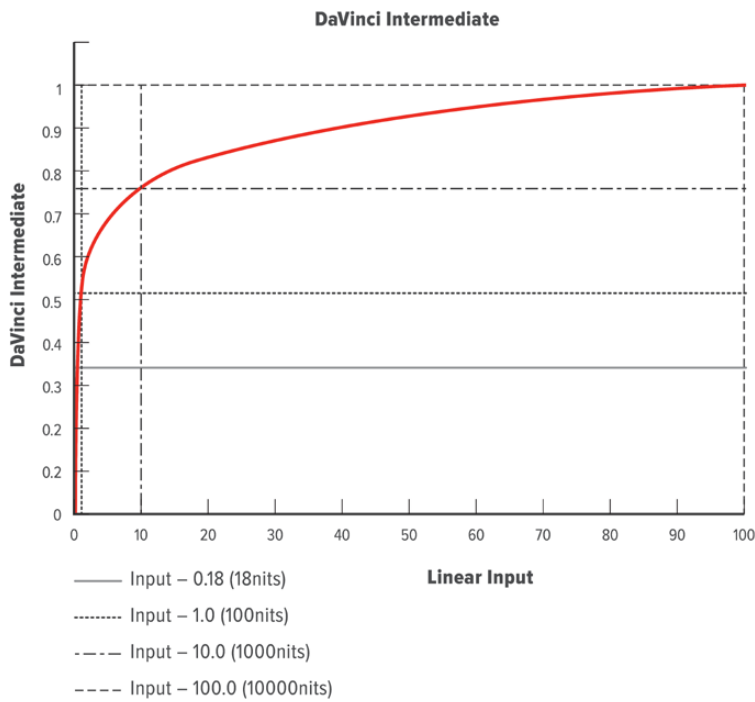
The DaVinci Intermediate OETF seen encoding HDR levels
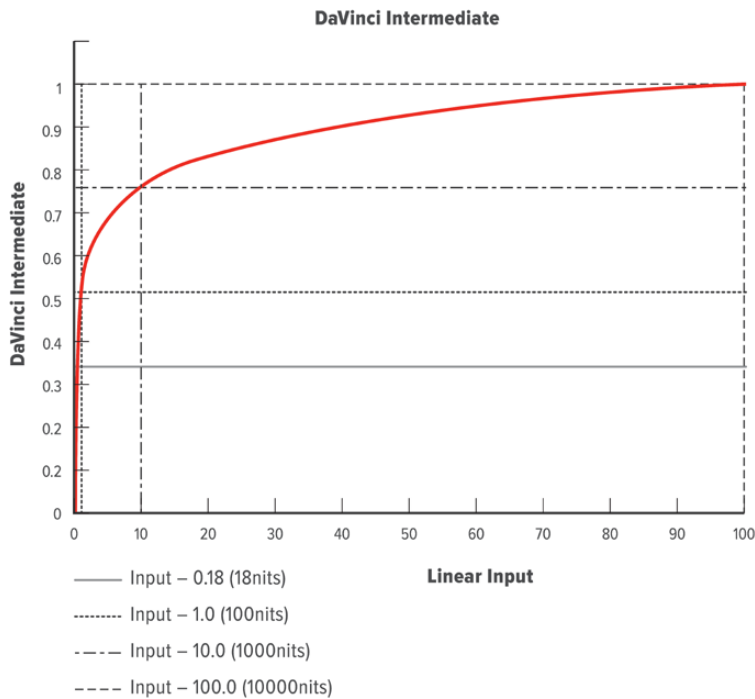
The DaVinci Intermediate OETF encoding SDR levels

Resolve Color Management is extremely flexible, so you don't have to use DaVinci Wide Gamut/DaVinci Intermediate as your Timeline color space if you don't want. However, it presents many advantages and is worth trying out to see if it can improve your workflow.

Timeline Working Luminance

This control is only visible while the Resolve Color Management presets menu is set to Custom Settings. The Timeline Working Luminance drop-down menu lets you choose how the Input DRT (described below) maps the maximum level of a source image to the currently selected Timeline Color Space. This setting also defines the maximum highlight level that's possible to output into the currently selected Output Color Space using the Output DRT.

While it's typical to set this according to the mastering standard you're grading to via a collection of SDR and HDR labeled settings, there are additional settings available that make it possible to add more automatic compression of highlights as you grade.

- **SDR 100:** The conventional setting for grading SDR material with a maximum level of 100 nits.
- **HDR 500-4000:** Conventional settings for grading HDR material at a variety of maximum mastering levels. So long as output DRT isn't set to None there will be some manner of rolloff in the highlights, unless inverse DRT is enabled in which case there will be no rolloff.
- **SDR and HDR ER settings:** These "extended range" settings each specify two values and provide more headroom for aggressive grading of highlights by enabling DaVinci Resolve to compress a greater range of out-of-bounds image data without clipping, which can result in a smoother look.

  Here's how it works. Suppose you choose the setting "HDR ER 1000/2000." In this case, the Input DRT is used to map the maximum brightness of each source image to the range specified by the first value, which is 1000 nits. Then, when you grade, the signal isn't clipped until it reaches the maximum range specified by the second value, which is 2000 nits. This provides an additional 1000 nits of out-of-bounds headroom before the image data is hard clipped by RCM's image processing pipeline. The Output DRT is then used to map from the maximum brightness specified by the second number (2000 nits) to the output value defined by the currently selected Output Color Space, in the process compressing this out-of-bounds headroom to preserve as much highlight detail as is possible given the range you've selected.
- **Custom:** Exposes a field where you can enter a specific nit value.

Input DRT Tone Mapping

This control is only visible while the Resolve Color Management presets menu is set to Custom Settings. RCM has always transformed the color primaries of different media formats to match one another within the shared Timeline Color Space. In this updated version, the Input DRT (Display Rendering Transform) drop-down menu provides a variety of different options to enable DaVinci Resolve to automatically tone map the image data of SDR and HDR clips to better match one another when they're fit into the currently selected Timeline Color Space. While each option varies in the details, they are all automated input-to-timeline color transforms that do the following:

- Log-encoded media, or media using a 2.4 gamma transfer function, is mapped so the black point, midtones at 18% gray, and white levels match those of HDR media. Highlight data will be carefully stretched as necessary so that the highlights of all clips in the timeline, whether SDR or HDR, are treated similarly.
- Raw formats such as BRAW, RED, and ARRI RAW, and media using HDR transfer functions are minimally mapped along an HDR range of tonality.
- All color transforms into the Timeline Color Space are done without clipping.

The idea is to distribute the image data of each clip in the timeline, be it SDR or HDR media, along a similar histogram, with shadows, midtones, and highlights spread out in such a way as to create an easier starting point for grading. One result of this is that grades made for one type of media mostly work well with other types of media.

Different options are provided governing the details of how this Input to Timeline Color Space transform is achieved. They all do the same thing but have different advantages.

- **None:** This setting disables Input DRT Tone Mapping. No tone mapping is applied to the Input to Timeline color space conversion at all, resulting in a simple 1:1 mapping to the Timeline Color Space.
- **Simple:** A good mapping for color transforms from HDR to SDR.
- **Luminance Mapping:** Same as DaVinci, but more accurate when the Input Color Space of all your media is in a single standards-based color space, such as Rec.709 or Rec.2020.
- **DaVinci:** This option tone maps the transform with a smooth luminance roll-off in the shadows and highlights, and controlled desaturation of image values in the very brightest and darkest parts of the image. This setting is particularly useful for wide-gamut camera media and is a good setting to use when mixing media from different cameras.
- **Saturation Preserving:** This option has a smooth luminance roll-off in the shadows and highlights, but does so without desaturating dark shadows and bright highlights, so this is an effective option for colorists who like to push color harder. However, because over-saturation in the highlights of the image can look unnatural, two parameters are exposed to provide some user-adjustable automated desaturation.
  - **Sat. Rolloff Start:** Lets you set a threshold, in nits (cd/m2), at which saturation will roll off along with highlight luminance. Beginning of the rolloff.
  - **Sat. Rolloff Limit:** Lets you set a threshold, in nits (cd/m2), at which the image will be totally desaturated. End of the rolloff.

Output DRT Tone Mapping

This control is only visible while the Resolve Color Management presets menu is set to Custom Settings. The Output DRT (Display Rendering Transform) drop-down menu provides new options.

- **None:** No tone mapping is applied to the Timeline to Output color space conversion at all, resulting in a simple 1:1 output with no softness or rolloff applied. All image data outside of gamut will be clipped.
- **Simple:** A good mapping for color transforms from HDR to SDR.
- **Luminance Mapping:** Same as DaVinci, but more accurate when all your media is in a single standards-based color space, such as Rec.709 or Rec.2020, set to the Timeline and Output.
- **DaVinci:** This option tone maps your output with a smooth luminance roll-off in the shadows and highlights, and controlled desaturation of image values in the very brightest and darkest parts of the image. It's been designed to give smooth, naturalistic highlights and shadows as you push and pull the values of your images, without the need for additional settings. This setting is particularly useful for wide-gamut camera media and is a good setting to use when mixing media from different cameras.
- **Saturation Preserving:** This option has a smooth luminance roll-off in the shadows and highlights, to prevent clipping. It does so without desaturating dark shadows and bright highlights, so this is an effective option for colorists who like to push color a bit harder. However, because over saturation in the highlights of the image can look unnatural, two parameters are exposed to provide some user-adjustable automated desaturation.

- **Sat. Rolloff Start:** Lets you set a threshold, in nits (cd/m2), at which saturation will roll off along with highlight luminance. Beginning of the rolloff.
- **Sat. Rolloff Limit:** Lets you set a threshold, in nits (cd/m2), at which the image will be totally desaturated. End of the rolloff.

- **RED IPP2:** This setting lets you use RED IPP2 tone mapping to output to an SDR format, such as Rec.709; two settings are exposed with which to choose how your output will be shaped.
  - **Output Tone Map:** Lets you choose what kind of tone mapping you want to use for your output. Options include None, Low, Medium, and High.
  - **Highlight Roll Off:** Lets you choose what kind of highlight rolloff you want to use to prevent clipping. Options include None, Hard, Medium, Soft, and Very Soft.
  - **HDR peak nits:** A slider lets you choose the peak nit level you want to tone map to. Defaults to 10,000 nits.

Use Inverse DRT for SDR to HDR Conversion

This control is only visible while the Resolve Color Management presets menu is set to Custom Settings. A device rendering transform (DRT) is typically used when converting high dynamic range media to a lower dynamic range color space/mastering standard. Thus, setting up a color transform from SDR to HDR is an "inverse" operation to expand the dynamic range of SDR media to HDR standards. The way this works is that levels at 100 nits are mapped to the maximum value set for the Timeline Working Luminance parameter, and all other image levels are strategically tone mapped in order to give yourself a good starting point for grading SDR media into an HDR program.

This setting also has a secondary use. With this setting turned on, you can output Rec.709 clips with color that's identical to the input, with no compression in the highlights.

> **NOTE:** Turning on "Use Inverse DRT for SDR to HDR Conversion" may exaggerate noise in imported SDR media with large flat expanses of bright colors.

Color Space Aware Grading Tools

In DaVinci Resolve version 17, both Resolve Color Management and ACES enables "color space aware" palettes, such as the new HDR palette, to have controls that feel consistent no matter what color space the original media is from, or what Timeline Color Space you're using.

Other palettes, such as the Qualifier and Curves palettes, become color space aware when you turn on the "Use Color Space Aware Grading Tools" checkbox in the Color Management panel of the Project Settings (this is turned on by default). When you're using color space aware grading tools, you should not turn on HDR Mode for the node you're working on.

- In the case of the Qualifier palette, this enables Qualifiers to create high-quality keys as you would expect, no matter what the color space of the original media is, or what Timeline Color Space you're using.
- In the case of the Curves palette, this makes the overall range of each curve better fit the overall data range of the current clip, making curves adjustments easier and more specific.

> **NOTE:** This control is only visible while the Resolve Color Management presets menu is set to Custom Settings.

Apply Resize Transformations In

When you're using Resolve Color Management, a new "Apply Resize Transformations In" Project Setting is available in the Color Management panel while the Resolve Color Management presets menu is set to Custom Settings. This setting lets you choose which color space is used for resizing operations. Ordinarily, resizing is done in Linear, but certain specialty workflows benefit from doing resizing in other color spaces, so this option lets you choose which is best. The available options are:

- **Timeline:** Uses the Timeline Color Space to perform all resizing operations.
- **Log:** Uses a Log Color Space for resizing. Good for avoiding artifacts in certain high-contrast images such as titles and star fields.
- **Linear:** Usually provides the best results with most SDR media.
- **Linear Mapped:** Usually provides the best results with most HDR media.
- **Gamma:** Provided in case you find a need for this option.
- **Gamma Mapped:** Usually provides best results when mixing SDR media with wide gamut and log-encoded media on the same timeline.

Graphics White Level

A new "Graphics white level" setting lets you define a shared maximum level in nits (cd/m2) for titles, generators, and selected effects that generate color. Changing this setting lets you change the maximum level of all DaVinci Resolve-generated titles, generator graphics, and effects at once to accommodate different mastering and output requirements.

The RCM Image Processing Pipeline

To clarify the inner workings of Resolve Color Management for advanced users, the following flowchart presents a rudimentary overview of how every parameter works together to automatically manage the color of clips in your program.
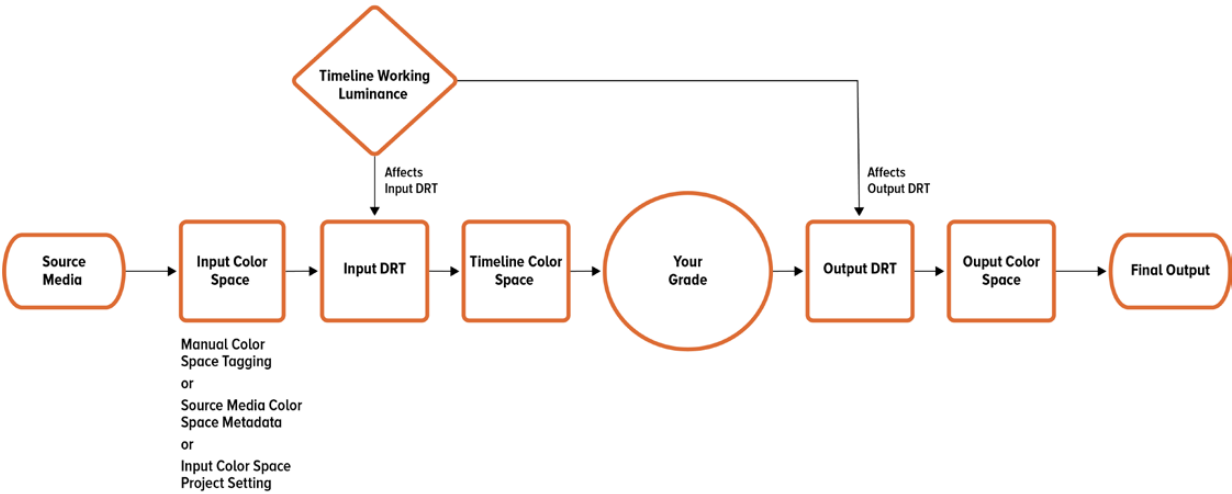
Resolve Color Management's image processing pipeline, illustrated

HDR Palette

The HDR palette is specifically designed to enable fast and flexible primary grading of wide-latitude media for either SDR or HDR output. It's the first of a new generation of "color space aware" palettes that work with Resolve Color Management to work with the known mapping of source image data within the HDR palette's own perceptually uniform operational color space, using advanced color processing algorithms that enable more efficient color and contrast adjustments, and perceptually uniform controls that make it easier to adjust all colors equally across the spectrum, while maintaining careful control of image saturation.
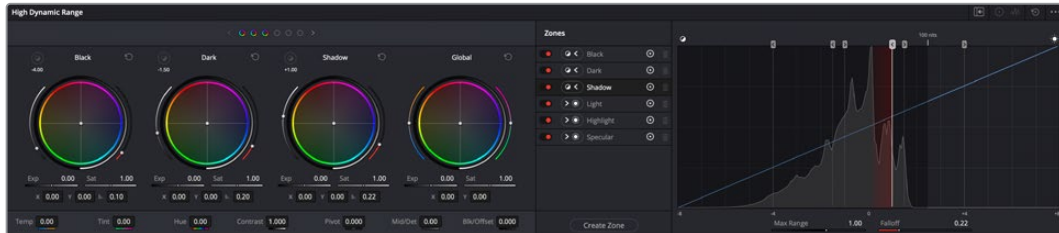
The HDR palette

A set of global controls, at the right of the palette, let you make foundational adjustments to the overall image, along with a set of Hue, Midtone Detail, Contrast/Pivot, and Black Offset controls at the bottom. Additionally, a set of overlapping zone-specific controls let you make color and contrast adjustments to specific ranges of image tonality. Altogether, the HDR palette lets you make primary grading adjustments that are both photographically naturalistic, and as tonally broad or specific as you require, while minimizing unwanted artifacts.

Despite its sophistication, the HDR palette uses color balance and slider controls that should be familiar to any colorist or editor familiar with the more conventional Lift/Gamma/Gain controls. Whether you're a grading professional or just getting started with color, the HDR palette will enable great results with less hassle once you learn how to harness its power.
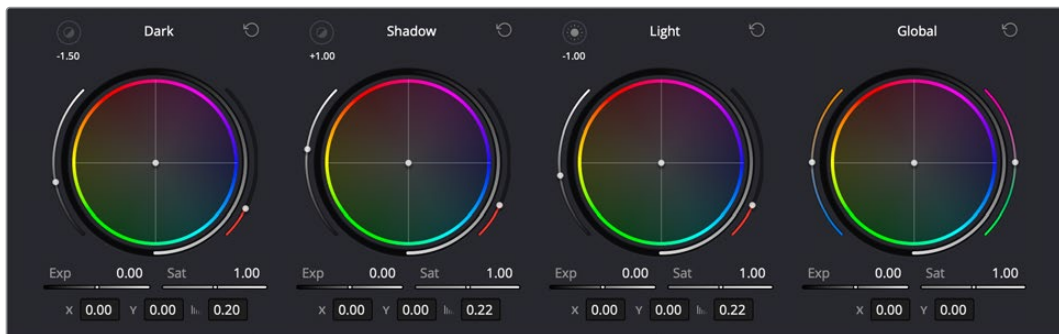
The controls panel of the HDR palette

TIP: Due to the increasing ubiquity of HDR-capable media and HDR streaming distribution workflows, the node HDR mode and HDR palette are both available without restriction in the free downloadable version of DaVinci Resolve.

What Makes the HDR Palette Special?

Before diving into the detailed use of the HDR palette's controls, it's important to understand a bit more about how the HDR palette processes image data, so you can better understand what advantages this tool presents.

Using the HDR Palette Without Color Management

While the HDR palette has been designed to work hand in hand with color management, you can use it in non-color managed workflows so long as you set it up correctly. The HDR palette option menu has Color Space and Gamma submenus that let you specify how you want to work. By default, both submenus are set to "Timeline" to reflect the color space you're choosing to work within in display-referred workflows.

Color Space Aware Controls When Using Color Management

The HDR palette really shines when you enable Resolve Color Management or ACES, because it's a color space aware palette that uses color management to full advantage. Being color space aware means that the color and contrast controls of the HDR palette conform themselves to the range of each clip's image data as mapped from the Input color space assigned to the source clip to the Timeline color space your program is working within. Practically, this provides two benefits:

- The controls of the HDR palette work and feel virtually identical no matter what type of source clip you're adjusting, and no matter which timeline color space you're choosing to work within.
- HDR palette adjustments made to one type of media will have a similar result when copied to other types of media. This makes makes matching shots and copying looks from one type of media to another easier than with previous tools.

> **NOTE:** Because the HDR palette is color space aware, it's not necessary to enable the HDR setting on nodes for controls to work intuitively while working within a wide gamut timeline color space, or delivering to an HDR format like ST.2084. The HDR palette takes care of this for you, automatically.

Perceptually Uniform Adjustments

Furthermore, the image data of each clip is converted from the Timeline Color Space to an operational color space used by the HDR palette, where the image is adjusted and then converted back to the Timeline Color Space again, ready for the next operation. The operational color space that's used by the HDR palette is perceptually uniform, which means that the range of values corresponding to each visible hue are distributed evenly throughout this color space.

While the HDR palette works well grading standard dynamic range (SDR) material, the underlying color science used by this palette also addresses issues that have inconvenienced colorists grading high dynamic range programs using traditional controls. These benefits include:

- Since the controls of this palette calculate all color transformations within a perceptually uniform color space, you will experience finer control over color adjustments in a more photographically intuitive way. For example, you may find that yellow hues are easier to grade within this palette, since there's a more even distribution of hues around the circumference of the color wheels.

- The HDR palette lets you make contrast adjustments without altering image saturation, meaning that unlike when you use the master wheels of the Lift, Gamma, and Gain panel, the HDR palette lets you raise image contrast without increasing image saturation, and lower image contrast without decreasing image saturation. You'll find this is particularly useful while boosting highlights in HDR grades, since you can now do so without causing extreme saturation increases in your highlights. In fact, all adjustments you make to contrast with these controls will adjust the image while keeping saturation unerringly constant (that is to say, perceptually speaking; you will in fact notice small saturation changes in the Vectorscope). This, of course, excludes the saturation controls.
- The HDR palette's deep integration with Resolve Color Management also makes matching shots and copying looks from one type of media to another easier than with previous tools. Whether you're a professional, or just getting started with color, the HDR palette will enable better results with less hassle.

Superior Temp and Tint Controls

Because the HDR palette is color space aware, the Temperature and Tint adjustments in this palette are themselves made using the same kind of XYZ to LMS color space transform used by the Chromatic Adaptation Resolve FX plug-in. The result is that Temp adjustments are photometrically accurate and create visual results similar to how the human vision system perceives changes to a scene due to a change in the color temperature of lighting.

Customizable Zones

Another unique aspect of the HDR palette is how it can be customized to suit a wide variety of working styles, specific tasks, and colorist preferences. Switching to the Zones panel reveals an interface for adjusting the Range and Falloff of each currently defined zone, using graphical controls overlaid onto a histogram of the current image, while a curve shows the user how the contrast and color adjustments they've made mathematically affect the RGB channels of the image within each zone. While the default zones preset provides an efficient starting point for many kinds of scenes, the varying tonal range of image data in different scenes, whether daytime, nighttime, interior, or exterior, will often require you to customize these zones to get the best results from adjustments using these controls.

The Zones panel lets you customize the tonal ranges that each set of zone controls affect

Additionally, the sidebar at the left provides controls for adding and removing zones, so users can customize this palette to work exactly the way they want. Any customized preset can be saved for easy recall. This way, users have the freedom to work in whatever way suits them.

The Option menu provides fast access to additional ways of customizing this palette's operation, including the selection and management of presets, a choice of methods for numerically editing Color Balance adjustments, and a setting that determines whether or not the Global controls are always exposed, or should be banked to like the other zone controls.

The HDR Palette Interface

The HDR palette is divided into two panels. The first, containing Color Balance controls and custom sliders, is for making color and contrast adjustments. The second, containing the Zones sidebar and Zones graph, is for customizing the range and falloff of each of the zones that corresponds to each set of controls found on the controls panel. It's these zones that are used for making detailed image adjustments to tonally-specific areas of the picture.

By default, both panels appear within the same palette area, and you can switch between them using buttons at the top-right of the palette. This is useful when you have limited screen real estate, or you're making simple adjustments. Alternately, you can click a button to expose both panels side-by-side, occupying both the left and middle palette areas of the Color page.

From left to right, the Side-by-side view button, the Controls panel, the Zones panel, the Reset control, and the Option menu

This side-by-side mode makes it easy to see and customize how each zone is mapped to the source image data, while making adjustments at the same time.
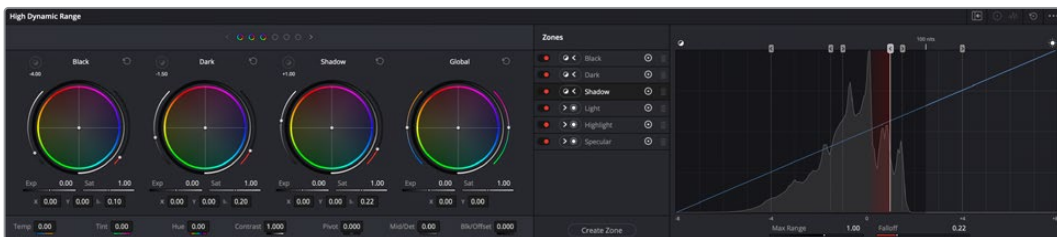
The HDR palette in side-by-side mode; at left, the Color/Exposure/Saturation controls; at right, the Zone Customization controls

An Option menu at the far right of the title bar (shown as three dots) reveals the preset manager for this palette, as well as different GUI options for customizing how you want to use this palette.

Navigating Multiple Zones in the Controls Panel

A row of buttons just under the HDR palette's title bar show you, of all available zones, which ones are currently adjustable using the visible controls below. While the default HDR palette preset has six zone-specific Zone controls, plus the Global controls, most users will only have room in the GUI for four sets of controls to be visible at any time. Meanwhile, grading control panel users will constrained by how many trackballs their particular control panel has.
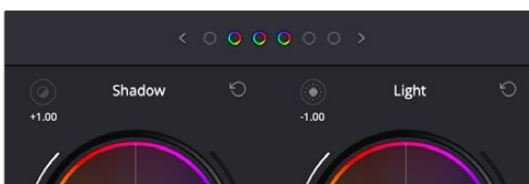
The Zone bank controls

Since you'll almost always have more zones available than you have room to adjust them, this interface lets you see which zones you're currently using, which zones are mapped to a control panel, and which other zones are available for you to switch to. By default, there are three active zones shown at the top, corresponding to the three sets of Zone controls to the left of the Global controls. Zones that are available, but hidden, are shown in gray to the left and/or right of the currently visible zones, which appear in color. This way, you can bank back and forth among three zones at a time, while always having the Global controls available for adjustment.

There's also a setting in the HDR palette's Option menu, "Bank Global With Color Wheels," that lets you use all four GUI control clusters in this palette to show Zones controls, making it faster to jump among tonally-specific adjustments. In this mode, there are four active zones shown at the top, corresponding to the four sets of Zone controls being shown. However, in this mode you must page all the way to the right to expose the Global controls, which are banked along with all the other zones.
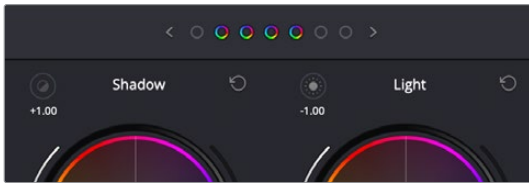
The Zone bank controls set to show four zones when the Global controls are banked with all the other zones

Using these controls, you can switch your visible control among all available zones similarly to how audio mixers switch among banks of tracks with a fader panel.

Methods of switching among different Zone controls:
- Click any gray zone button to the left of the currently visible zones to move all zones so that the leftmost visible zone appears at that one.
- Click any gray zone button to the right of the currently visible zones to move all zones so that the rightmost visible zone appears at that one.
- Click the left or right arrow buttons to either size of the zones indicators to move all zones one to the left or one to the right.

Making Global Adjustments

Generally speaking, if you're using the HDR palette to do primary grading, you'll probably want to begin with the Global controls. By default, these are found at the right of the Controls panel.
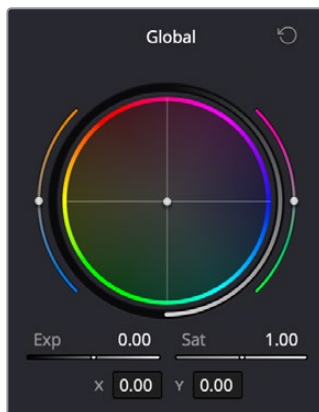
The graphical Global control cluster at the right of the HDR palette

These controls let you take the initial step of making an overall adjustment to the image. To adjust color, you have a color balance wheel, temp and tint sliders (to the left and right of the wheel, and also numerically below), and saturation adjustments. To adjust image contrast, a Global Exposure control lets you stretch overall image contrast up to brighten the image, or compress it down to darken it, relative to the current Black Offset level, which pins pixels corresponding to minimum black in place. A pair of Contrast/Pivot controls at the bottom of this palette let you manipulate overall color contrast by stretching highlights and shadows out or in relative to the pivot point, expressed in stops.

While Global color adjustments are somewhat similar to the offset, temp, and tint controls found in the Color Wheels or Log Wheels controls, there are important differences, described in detail below. The Global Exposure control, on the other hand, operates *very* differently from Master Offset.

Detailed Explanation of Global controls:

- **Global Color Balance:** A color balance control lets you simultaneously adjust the red, green, and blue channels somewhat linearly throughout the tonal range of the image, to freely rebalance the color. However, RCMv2 automatically maintains a smooth saturation and exposure rolloff in the maximum highlights and minimum shadows, so this effect becomes less pronounced in the blackest blacks and the whitest whites of the image (this appears more pronounced in test gradients than real world images). While adjustments made with this control won't lower the value of the darkest pixels in the image below the Black Offset level, individual color channels may dip below this level in order to preserve colorfulness in darker shadows. The resulting color adjustments made with this control are similar to how optical color filters placed over a lens would affect an image.
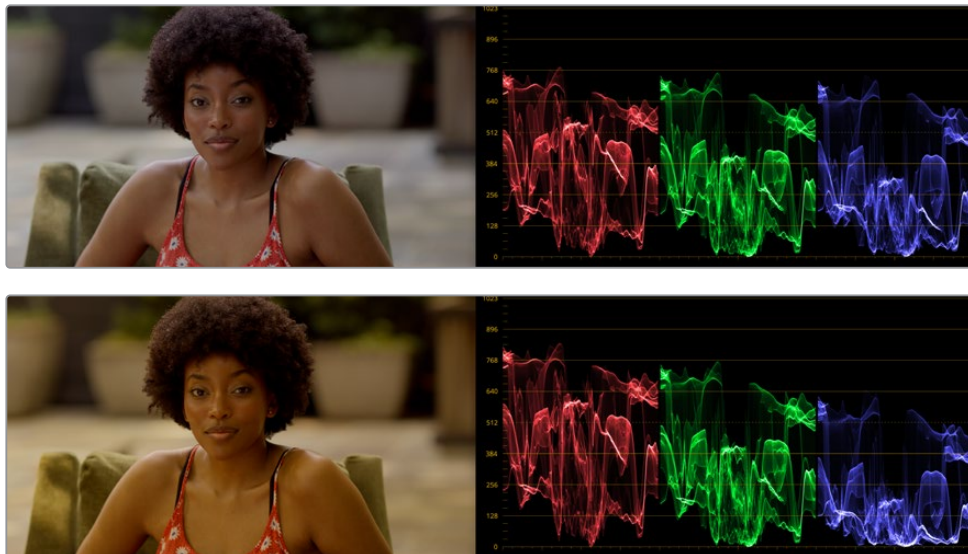
(Top) The original image, (Bottom) A Global Color Balance adjustment affecting the overall image, with a rolloff seen in the shadows and highlights of the superimposed ramp gradient

- **Global Exposure:** Brightens or darkens the entire image. Dragging to the right stretches image contrast by raising the highlights while keeping the shadows pinned relative to the Black Offset value. Dragging to the left lowers image contrast by lowering the highlights while keeping shadows pinned relative to the Black Offset value. For more explanation about the function of Black Offset, see the following section.

  Keep in mind that all contrast adjustments in the HDR palette keep saturation constant as contrast increases or decreases. This means that, when making large contrast adjustments to HDR images, image saturation will remain perceptually the same.

(Top) The original image, (Bottom) Raising Global Exposure

- **Global Saturation:** Raises or lowers the intensity of color throughout the image. Since contrast adjustments don't affect saturation, you must exercise manual control over any desired changes to image saturation.
- **Global Color Balance Value Fields:** Two numeric values represent how the color balance controls center handle position is represented. There are two ways of numerically showing this: as X and Y, or as Angle and Strength. You can choose either method from the HDR palette's Option menu; whichever method you choose determines how the center handle of all color balance controls is manipulated if you adjust these values directly.

At the bottom of the HDR palette, additional Global Temp and Tint, Hue, Midtone Detail, and Contrast/Pivot controls let you make other kinds of global adjustments to image color, detail, and contrast, in ways that are very similar to the identically named controls in the Color Wheels or Log Wheels controls. Additionally, there's a Black Offset control that lets you set the minimum allowable black level in the current shot.
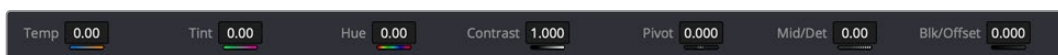
Global controls found at the bottom of the HDR palette

Detailed explanation of additional Global controls:

- **Temp:** This global temp adjustment lets you warm or cool the image with a range from -4000 to +4000 based on a kelvin scale. Adjustment follows the spectral locus line in the CIE graph: the intensity of adjustment is naturalistic. To minimize visual artifacts, this control is capable of warming the image more aggressively than cooling it.
- **Tint:** This global tint adjustment lets you add "plus green" or "minus green" adjustments with a range from -100 to +100 on an arbitrary scale.
- **Hue:** Rotates all hues of the image around the full perimeter of the color wheel. The default setting of 50 shows the original distribution of hues. Raising or lowering this value rotates all hues forward or backward along the hue distribution as seen on a color wheel.

- **Midtone Detail:** When this parameter is raised, the contrast of regions of the image with high edge detail is raised to increase the perception of image sharpness. The effect is sometimes referred to as definition. When this parameter is lowered to a negative value, regions of the image with low amounts of detail are softened while areas of high detail are left alone. 0 is unity. The range is –100 through +100.

- **Contrast:** This one parameter lets you increase or reduce the distance between the darkest and lightest values of an image, raising or lowering image contrast. The effect is similar to using the Lift and Gain master controls to make simultaneous opposing adjustments. Bright and dark parts of the image are pushed apart or brought together about a center point defined by the Pivot parameter. Unlike the Contrast control in the Primaries palette, the Contrast control in the HDR palette ignores the "Use S-curve for contrast" setting in the General Options panel of the Project Settings.

  Keep in mind that all contrast adjustments in the HDR palette keep saturation constant as contrast increases or decreases. This means that, even when making large contrast adjustments to HDR images, image saturation will remain perceptually the same to your eye, with small changes made to the actual saturation of the image in order to maintain this perception. Be aware that the tone mapping settings in RCMv2 will have an effect on how much saturation is maintained in the top highlights and bottom shadows of the image, versus being automatically rolled off at the outer boundaries of the signal.

(Left) The original image, (Right) Raising Contrast, saturation is kept perceptually constant, except at the outer boundaries of the signal in the top highlights and bottom shadows (depending on how you have your tone mapping set in RCM)

- **Pivot:** Changes the center of tonality about which dark and bright parts of the image are stretched or narrowed during a contrast adjustment. This lets you change how contrast is distributed among the shadows and highlights. The default value of 0 pushes highlights above 50% gray higher, and shadows below 50% gray lower, in equal proportion to one another. Changing the pivot point changes the percentage of image tonality about which contrast is either expanded or compressed.

  Darker images may require a lower Pivot value to push more levels up and avoid crushing the shadows too much when stretching image contrast, while lighter images may benefit from a higher Pivot value to push levels down and increase shadow density.
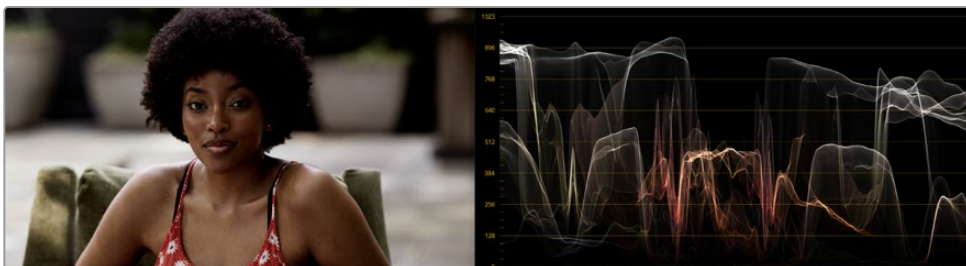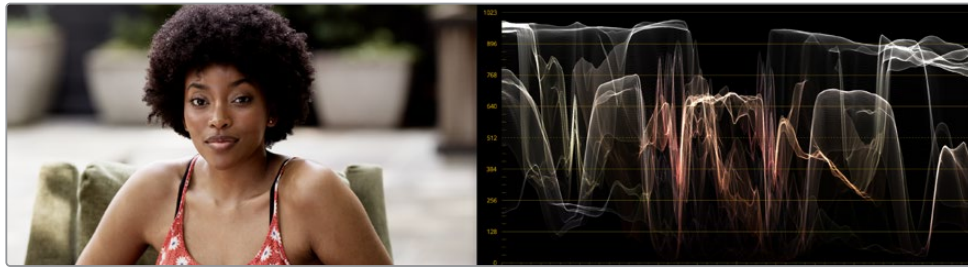
(Top) Altering contrast by raising Pivot, which redistributes most of the contrast expansion down towards shadows, (Bottom) Altering contrast by lowering Pivot, which redistributes most of the contrast expansion up towards the highlights

- **Black Offset:** Defines the darkest allowable part of the image. No adjustment by any other control in the HDR palette will ever go below this level, except for the occasional color channel if the shadows become extremely saturated. For more detailed information on this extremely important control, see the very next section.

Black Offset Explained

Of all the Global controls, the Black Offset control is one of the most deceptively important. Black Offset lets you define the darkest pixels of the image. Adjustments made to Black Offset do not offset the entire signal, they only affect the very darkest portion of the signal, letting you raise or lower the black point of the image while smoothly blending the resulting adjustment into the unadjusted portion of the image. The result is that you can compress or expand the bottom of your signal.

If you raise Black Offset, you can add "flaring" to the image, similarly to how light flaring within a lens might lighten the darkest part of the image.
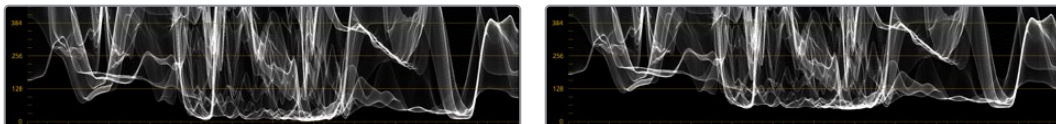
(Left) The original image, (Right) Raising Black Offset in order to add flaring to the darkest pixels of the image

Alternately, you can lower Black Offset to lower the very darkest pixels in the image. If the source image is dark enough, this control can lower the darkest pixels below 0, however this image detail is preserved in the color image processing pipeline

The most important thing to understand about this control is that level to which you set Black Offset becomes the new level at which Global exposure adjustments are made. In the following example, the first image shows the original color of a clip that was exposed to be dark. In the second image, Black Offset is adjusted to raise the darkest parts of the image, compressing them relative to the midtones and introducing a pleasing flaring effect to the shadows.

(Left) The original image; (Right) The image with Black Offset raised

In the following image, Global Exposure is raised, and you can see in the Waveform scope that the exposure change stretches the contrast of the image up, with the darkest pixels "locked" to the Black Offset you set.
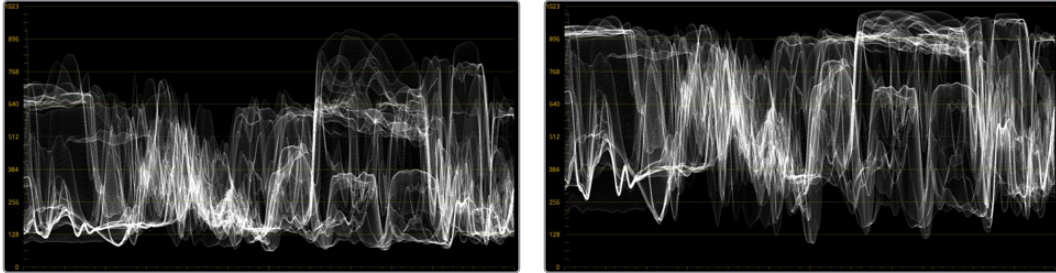
(Left) Before, (Right) After raising Global Exposure to stretch image contrast out from the Black Offset level; notice that the bottom of the signal continues "touching" the same level after global exposure is raised

The Black Offset level you set also becomes the minimum picture level when you lower exposure, either using the Global Exposure changes, or when you use any of the "darkening" zone controls such as Shadow, Dark, and Black. The following image shows the result of lowering Global Exposure; the shadows of the image are compressed more heavily than the highlights as exposure is lowered, with the result that the minimum value of the image remains at the Black Offset level you set. With shadow detail impressively preserved, this compression rolls off smoothly and nonlinearly through the midtones so that the image continues to look as natural as possible.
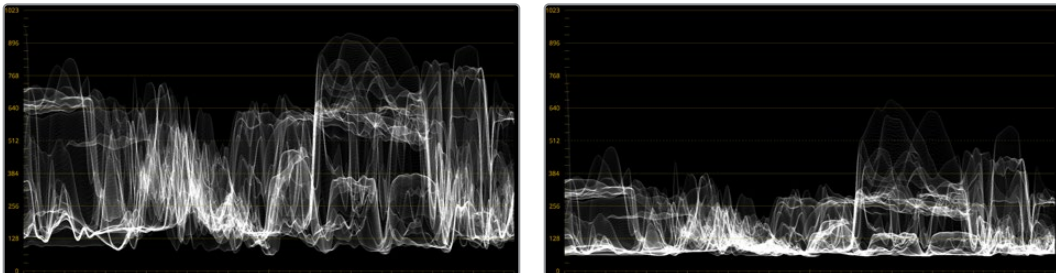
(Left) Before, (Right) After lowering Global Exposure to compress image contrast down to the Black Offset level; notice the signal never goes lower than the Black Offset level

This is also true when using other darkening zone exposure controls, such as the Shadow control, which selectively pushes the exposure of the darker part of the image down, while leaving the highlights alone. While reducing Shadow exposure, the darkest pixels still compress so that nothing goes beneath the Black Offset level you set.

Bottom line, you can adjust Black Offset at any time, either before or after any other Global or Zone adjustments, to fine tune the image as necessary.

Making Zone-Based Adjustments

After you've made whatever initial Global adjustments you want, you can optionally make more tonally-specific adjustments to the image via the Zone-based color and contrast controls to the left. These divide the image into multiple overlapping "zones," which are somewhat similar in principal to Ansel Adams' zone system, which divides images into tonally-specific regions based on image luminance, from pure black, through progressively lighter shadows, to 18% gray as the middle value centering the midtones of most images, and then up through progressively lighter highlights on the way to the last zone of pure white.
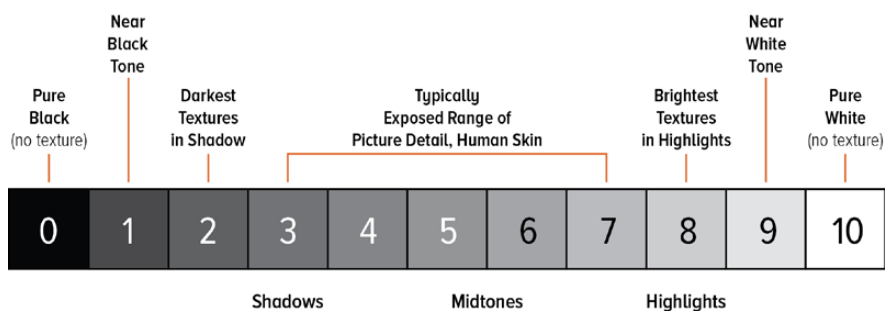
Simplified illustration of Ansel Adams' zone system

While Adams' zone system was meant to teach people how to think about using the available range of the photographic medium when exposing images, the zones of the HDR palette let you put this concept into practice by allowing you to make tonally-specific Color Balance, Temp, Tint, Saturation, and Exposure adjustments that only affect the range of shadows or highlights that fall within that zone.

Using the default preset, the shadows of your image are divided into overlapping Shadow, Dark, and Black zones, while the highlights of your image are divided into separate overlapping zones for Light, Highlight, and Specular ranges. The chart below illustrates the relationship of these zones to one another.
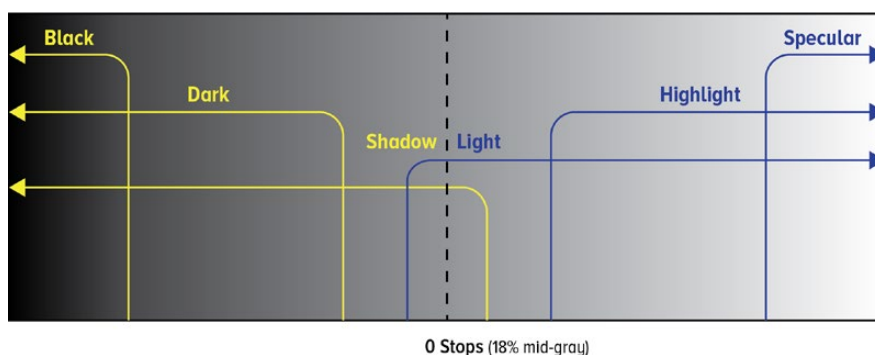
Approximation of the overlapping zones in the HDR palette that can be individually adjusted

NOTE: All of the examples in this section have Timeline to Output Tone Mapping set to None, to keep the ramp gradient linear for purposes of this explanation.

Zone-Based Color Adjustments

Understanding how adjustments made using these overlapping zones interact with one another is key to knowing what you can do using the HDR palette. Keep in mind that every zone is customizable, but here's how the default zone definitions work to let you make detailed image adjustments. For clarity, Zone adjustments are shown made to a linear ramp gradient image, to demonstrate exactly what tonal portion of each image is affected by each control.

- The Light and Shadow zones are the most broadly defined zones. Together, they cover the entire tonal range of your image. They softly overlap one another by two stops at the center of the tonal range (50% gray or 18% exposure); this is where adjustments made to Light mix together with adjustments made to Shadow, resulting in both adjustments softly blending together. Making exposure adjustments to these two zones lets you manipulate overall image contrast by selectively compressing/expanding

contrast in the shadows and/or highlights relative to one another. Using the color controls lets you make broad color adjustments to the upper (highlights) and/or lower (shadows) range of image tonality.
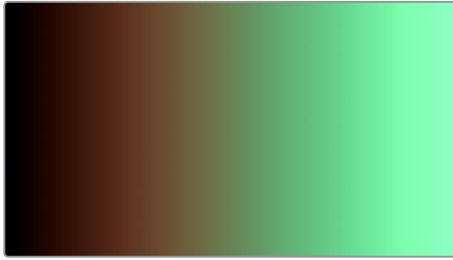
Color adjustments to a ramp gradient show the Light
(tinted green) and Shadow (tinted orange) zones

- The Dark and Black zones overlap two progressively lower luminance ranges of the Shadow zone. Dark is useful for adjusting the color or contrast of the deeper shadows, while Black is useful as a trim that lets you manipulate the very darkest parts of an image. All adjustments you make to Dark are mixed with any adjustments made to Shadow, and all adjustments made to Black are mixed with the adjustments made to Dark and Shadow. In this way, all color adjustments you make to overlapping Shadow zones mix smoothly together to produce the final result, as seen in the following ramp gradient.
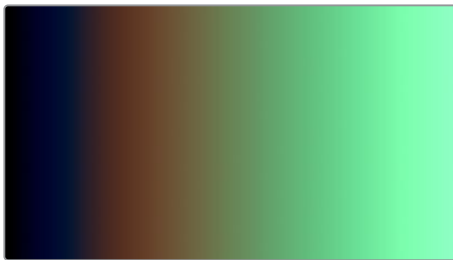
Color adjustments to a ramp gradient show the Dark
(tinted blue) overlapping the Shadow (tinted orange) zone

- The Highlight and Specular zones overlap two progressively brighter luminance ranges of the Light zone. Highlight lets you adjust the color and/or contrast of the brightest highlights, while Specular is useful as a trim that lets you manipulate the very brightest highlights of an image. All adjustments you make to Highlight are mixed with any adjustments made to Light, and all adjustments made to Specular are mixed with the adjustments made to Highlight and Light. In this way, all color adjustments you make to overlapping Highlight zones mix smoothly together to produce the final result, as seen in the following ramp gradient.

Color adjustments to a ramp gradient show the Highlight
(tinted yellow) overlapping the Light (tinted green) zone.

As you can see, each one of these zones allow the specific adjustment of whichever parts of the image fall within the luminance range of that zone (as defined on the Zones panel), while providing control over how smoothly one adjustment fades into the next, to prevent unwanted contouring. As you make adjustments to the Range and Falloff of each zone using the different sets of zone controls, they work together to smoothly manipulate the contrast and color of the image, similarly to if you were using a more precise and constrained version of the Custom Curves. In fact, you can see the actual adjustment you're making by exposing the Zone graph.
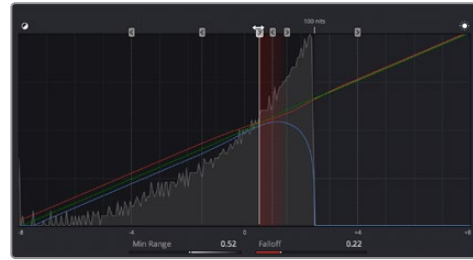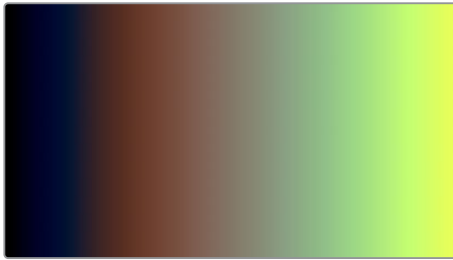
(Left) Raising the Range of the Light zone to expand the Shadow zone's range of influence, (Right) The same adjustment seen in the Zone graph

Working this way allows a tremendous specificity of adjustment, without the need to use curves or qualifiers. For example, zone-specific Color Balance controls allow you to grade the highlights and shadows separately using the Shadow and Light zone controls to quickly create a warm/cool split lighting effect. This makes the creation of dynamic grades more efficient and more creative.

(Left) The original image, (Right) Using the HDR palette to warm the highlights and cool the shadows (exaggerated for print)

In this next example, the Dark zone's color balance control is used to add a splash of green to the darker shadows of the image, while the Black control is used to neutralize this green in the very blackest shadows.

(Left) The original image, (Right) Using the HDR palette to add green to a narrow range of shadows

Zone Based Exposure Adjustments

Each zone has its own Exposure control, that allows you to stretch image contrast from that zone's Min or Max range boundary either down towards the shadows, or up towards the highlights. As seen on the Zone graph (found on the Zone panel), exposure adjustments are made on a scale measured in stops, to provide a more photographic experience when grading wide dynamic range material.

The scale of the Zone graph shows you the shadow and highlight ranges, in stops, relative to 0 representing 18 percent photographic gray

On this scale, 0 stops corresponds to photographic 18% gray, at the center of each image's tonal range. Shadows then fall to the left over -8 stops, while highlights fall to the right over +8 stops, where each stop represents either twice the amount of light (stopping up) or half the amount of light (stopping down).

In conjunction with Resolve Color Management, this range is designed to accommodate any SDR or HDR range you'll be mastering to. All HDR palette controls are designed to accommodate up to 16 stops of exposure. By comparison, most modern digital cinema cameras claim to be able to capture somewhere between 13-19 stops of dynamic range, while a white paper from the ASC states that modern film negatives are capable of capturing 14 stops of dynamic range.

Unlike the Lift/Gamma/Gain or Log master level controls, the Exposure adjustment of each zone starts at a specific boundary of image tonality, and stretches all the way out through the highlights or shadows, through the maximum or minimum signal level allowable. Since Shadow and Light are the two zones that are centered on the midtones of the image, they're the best zones for seeing how this works. Because of this, these are also probably the first two zones you'll want to adjust if you're making more specific exposure changes to the image.

Using the default preset, Shadow exposure adjustments affects everything in the image from stop 1 down through absolute black.

(Left) The original image, (Right) Darkening all shadows by lowering the Shadow exposure adjustment

Meanwhile, Light exposure adjustments affect everything in the image from -1 stops all the way through maximum white.

(Left) The original image, (Right) Lightening all highlights by raising the Light exposure adjustment

This ability to make open-ended adjustments to image contrast in different overlapping ranges of shadow and highlight tonality makes these controls uniquely suitable for HDR grading, while also being completely suitable when grading at SDR levels. Also, keep in mind that all contrast adjustments in the HDR palette keep saturation constant as contrast increases or decreases.

This is particularly useful when making large contrast adjustments to HDR images, for which a 300 nit expansion of highlight contrast using the Lift/Gamma/Gain or Log controls would create a huge saturation increase. Using the HDR palette to expand highlight contrast keeps image saturation perceptually the same, while offering zone-specific saturation controls that let you choose whether to increase or decrease the saturation falling within that zone.

Exposure adjustments to zones that overlap other zones are smoothly combined to allow targeted contrast adjustments while making it relatively easy to avoid unwanted artifacts, like contouring or solarizing due to overzealous inversion of the curves caused by these operations.

An Example of Zone-Based Exposure Adjustment

To see this in action, let's see what happens when we make some overlapping adjustments to the Light, Highlight, and Specular zones in order to grade some HDR highlights, focusing our attention on the Waveform scope, since it's difficult to see HDR grades in print. Keep in mind that you won't usually be making Zone-based Exposure adjustments by themselves. This example image has had a Contrast/Pivot adjustment to push the midtones and shadows down, to give the shadows greater definition. Then, Black Offset is raised to lift the darkest shadows up just a little bit, so they can breathe. This leaves us with an image that's mostly under 200 nits to begin with. A perfect starting point for us to begin sculpting those highlights.
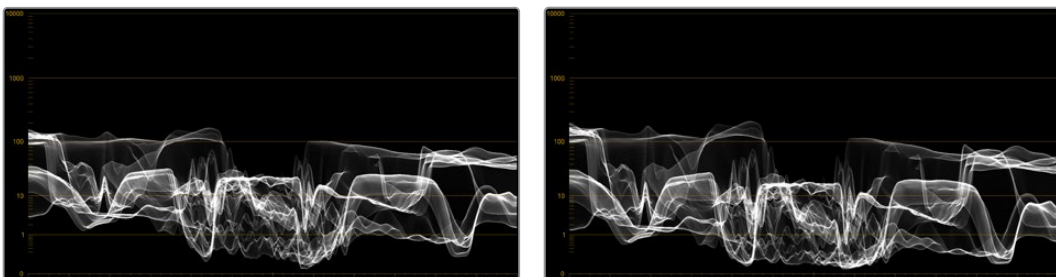
(Left) The original image; (Right) After changing Contrast/Pivot, and raising Black Offset

Using the default preset, making an exposure adjustment to the Light zone smoothly raises everything in the source image above -1 stops on the Zone graph. Practically, it's stretching up all levels above 10 nits on the HDR scope. This smoothly boosts the brighter part of the image, while leaving the shadows down where we put them.
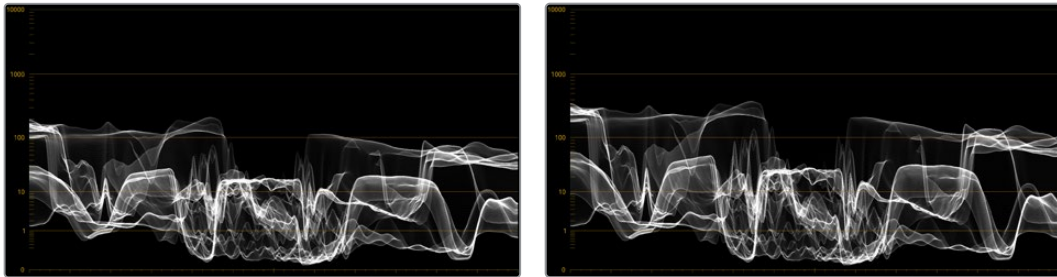
(Left) The previous adjustment; (Right) After raising Light Exposure

At this point, making an exposure adjustment to the Highlight zone boosts all levels above 1.5 stops on the Zone graph. Again, practically speaking, all levels above 100 nits are being boosted, brightening the top highlights. In the image, you can see that we're creating a greater differentiation between dimmer and brighter highlights in the image, creating highlight contrast with greater detail where once there were simply flat pools of light.
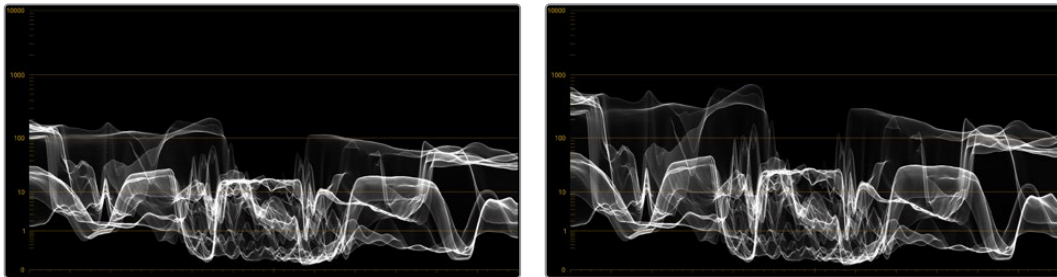
(Left) The previous adjustment; (Right) After raising Highlight Exposure

Now, this might be a fine place to stop, but since we're interested in turning the HDR in this image up to 11, we can put the highlights over the top by making one more Exposure adjustment, to the Specular zone. The Specular zone starts at 4 stops and is designed to let you boost or attenuate only the very brightest, hardest highlights, likely corresponding to specular details such as chrome reflections, eye glints, and directly photographed light sources. You won't always use this control, but it's useful to know about.

In this example, the default Specular Zone Min Range control is outside of the available image data in the image (seen as the right edge of the histogram in the Zone graph), so making adjustments with this control won't do anything. However, dragging the Min Range control to intersect the end of the histogram will allow these controls to affect the very brightest pixels in the image.
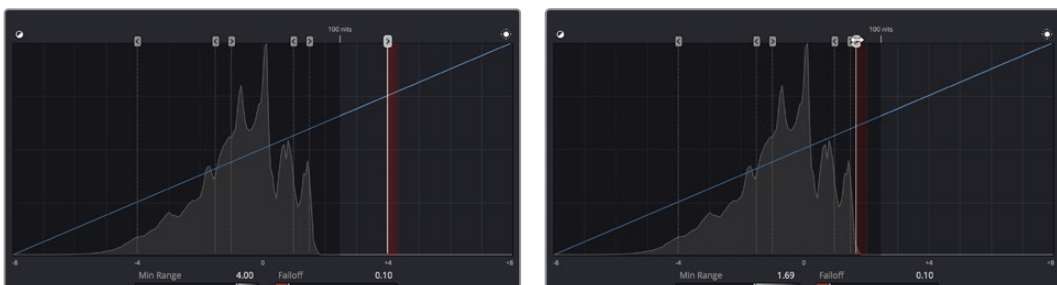
(Left) The original distribution of zones in the Zone Graph; (Right) Dragging the Specular Min Range handle to intersect the brightest highlights in the image histogram, to allow the Specular controls to affect that part of the image

Now, the Specular Exposure control lets us push the very brightest pixels of our image up, further differentiating them from the other highlights, and widening the audience's sensation of highlight contrast.
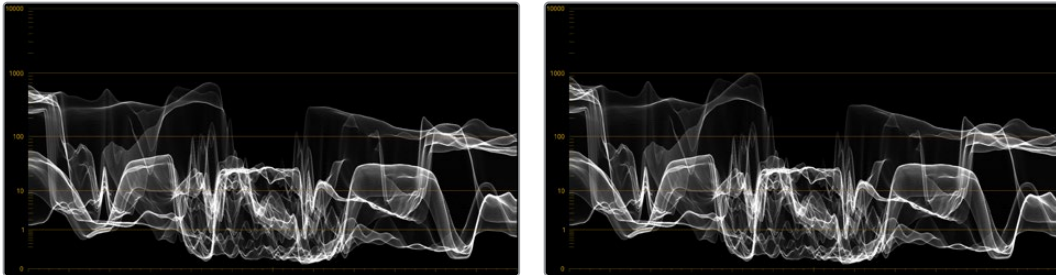
(Left) The previous adjustment; (Right) After raising Specular Exposure to bring the very brightest highlights to 1000 nits

Now, having selectively boosted the Highlight and Specular zones, you might decide that you like the differentiation that's been created among different brightnesses of highlights, but the overall highlights are too bright. This is easily fixed by lowering the Light zone's Exposure adjustment. As a result of this one adjustment, all of the highlights are scaled down, while the adjustments you've made to the Highlight and Specular zones maintain a relative influence on the parts of the image they're brightening. The Shadow, Dark, and Black controls work similarly, but for the shadows.
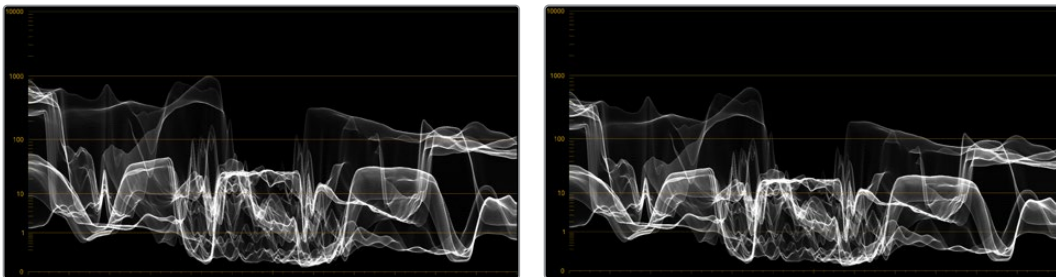
(Left) The previous adjustment; (Right) After lowering Light Exposure, all levels smoothly scale down to reduce the brightness of the highlights while keeping the differentiation you've created with the Highlight and Specular controls

Now that you've seen how all overlapping Zone adjustments work together to create a seamless adjustment, it's time to look at the Zone controls in more detail.

Zone Controls

Each individual zone also has controls for Color Balance and Saturation, which let you make focused adjustments that fall within specific ranges of image tonality, all without needing to use a qualifier. Using all of these zones together, you can make fast, precise, and smooth adjustments to the image that feel incredibly natural. Despite the name of the palette, this allows careful adjustment of SDR images, as well as creative adjustment of the spectacular range of highlights that HDR enables. There are also Range and Falloff controls to the left and right of each cluster of controls that let you redefine each zone's area of influence, even if the Zone graph is hidden.
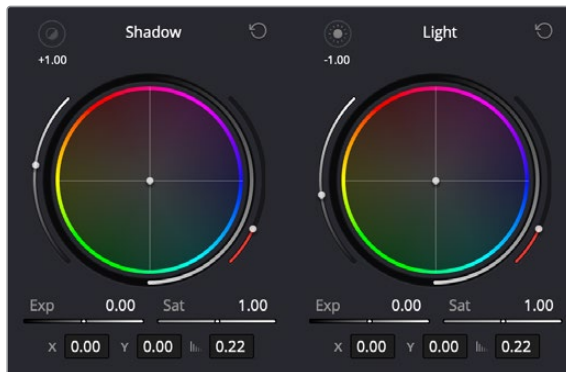
The Shadow and Light zone controls next to one another; you can see the Min and Max indicators, along with the Range value (in stops) at the upper left of each group of controls

- **Range indicator:** An icon and value at the upper-right-hand corner of each zone control cluster shows that zone's range. A numeric value shows the range value, which is the Luminance level of image tonality at which that zone's adjustment begins. This value is expressed in stops, while an icon shows you whether it's a maximum range (affecting shadows) or a minimum range (affecting highlights).

  Clicking the icon shows a temporary preview in the Viewer of which parts of the image will be affected by the controls of that zone. Affected areas appear in full color, unaffected areas appear black.

- **Zone-specific Color Balance:** A color balance control lets you readjust the relative strength of the red, green, and blue channels within the current zone of image tonality.

- **Zone-specific Exposure:** Zone-specific Exposure controls work in conjunction with an adjustable pivot that defines the Luminance level that each exposure adjustment starts from. To accommodate both shadow and highlight adjustments, there are two kinds of pivots, labeled Maximum and Minimum range, and indicated using an icon. Max Range controls, such as the Shadow control, start at a maximum value with exposure adjustments stretching image contrast downward towards the shadows. Min Range controls, such as Light, start at a minimum value with exposure adjustments stretching contrast upwards towards the highlights. Each zone also has a falloff that specifies how much of that zone overlaps neighboring zones (starting at the pivot level) in order to blend overlapping adjustments softly enough to prevent contouring.

- **Zone-specific Saturation:** Adjusts the intensity of color within the current zone of image tonality.

- **Min/Max Range:** Defines the level of image tonality at which that zone's adjustment starts. This value is expressed in stops. Identical to the Min or Max Range slider in the Zone panel. Useful for tweaking Range while the Zones graph is hidden.

- **Zone Falloff:** Defines how softly this zone fades into all overlapping zones. Identical to the Falloff slider in the Zone panel, the value is visible in the virtual slider below. Useful for tweaking Falloff while the Zones graph is hidden.

- **Zone-specific Color Balance Values:** Two values expose the current color balance operation numerically. The option menu lets you choose between representing these as X and Y, or as Angle and Strength.

Customizing Zones Using the Zone Panel

Similarly to the controls of the Log palette, how these zones overlap can be adjusted in order to make each zone's controls work best for the tonal distribution of the images in any given scene. Zone overlap is governed by individual pairs of Range and Falloff controls, so you can make precise adjustments no matter what the distribution of tonality is in the image you're grading. All zones are organized and customized using the Zone panel, which is divided into the Zones sidebar to the left, and the Zone graph to the right.

The Zone panel of the HDR palette

The Zone Sidebar

The Zone sidebar show a list of all the zones in the current preset. This list is sorted by range values, with minimum range zones (affecting shadows) appearing at top and maximum range zones (affecting highlights) appearing below. Clicking any zone in the list selects that zone, which also selects that zone's boundary handle in the Zone graph at the right.

Zone sidebar controls:

- **Enable Zone toggle:** Toggles let you turn each zone on and off. Disabled zones will not be rendered.

- **Max/Min button:** Defines whether the adjustment of a particular zone affects the image from the current range value and below (Max) or the current range value and higher (Min). This setting is typically used when creating your own custom preset, to define which zones stretch down towards the shadows and which zones stretch up towards the highlights.

- **Show/Hide Zone button:** This button lets you hide sets of zone controls you don't want to adjust any further, leaving more room in the UI and on your control surface for the zones you do want to adjust. For example, if you decide you don't need to use the default Black and Specular zones, you can hide them so that only the Dark, Shadow, Light, and Highlight zones are available to switch among. Zone controls with adjustments made to them continue to affect the image even if the controls are hidden.

- **Delete Zone button:** Deletes that zone. This is primarily useful when you're creating your own zone preset. At the time of this writing, you cannot delete any of the default zones found in the default Zone preset.

Additionally, you have the option of adding zones, and saving zone presets to create your own custom ways of adjusting the image.

To create a new zone:

1 Open the Zones panel.

2 Click Create Zone, at the bottom of the Zones sidebar.

3 When the Create Zone dialog appears, choose the Zone type you want that zone to have (Dark/Min Zone or Light/Max Zone), enter a Name, and define the Pivot and Falloff values. Pivot, Falloff, and Zone type are editable later, so don't worry if you don't set them up perfectly the first time.
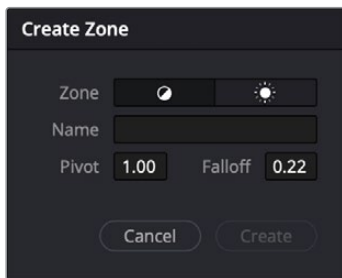
The Create Zone dialog

4 Click Create. That zone appears added to the list, which is sorted in the order in which Pivot is defined, with Dark Zones appearing at the top, and Light Zones appearing at the bottom.

Zones Graph

The Zone graph is a key component of the HDR palette's use. Along the bottom, a scale in stops shows the range over which the HDR palette operates. At the top, handles let you adjust the editable range boundaries that define the tonal range of each zone's operation, superimposed over a histogram showing the current image as input into the current node. Running through the middle of the Zone graph, a curve shows you all the Global and Tonal color and contrast adjustments being made by the HDR palette in the current grade.

The Zone graph

The relationship of the range boundaries with the source image histogram in this graph is extremely important. The range boundary for a particular zone must intersect with the part of the source histogram you want to adjust for the controls of that zone to have any effect. If any zone boundaries lie outside of the histogram, that zone's controls will do nothing. In the screenshot above, the zone's range boundaries all lie inside of the visible histogram, so each zone's controls will make a predictable adjustment to the image data in that part of the histogram.

In the following screenshot, the Zone graph shows that the Specular zone boundary lies outside of the source histogram for the image, so adjustments made using the Specular controls will have no effect. For this reason, it's a good idea to check that the zone boundaries intersect the parts of the image you want to adjust prior to manipulating the controls, but if you notice that a particular zone's controls aren't having as much of an effect on the image as you'd like, you can always move the zone boundary after the fact to expand the range of the image that's affected by that zone.

The Specular zone boundary lies outside of the source histogram,
excluding the Specular controls from affecting the image

Customizing zone boundaries in this way is one of the most powerful aspects of the HDR palette, but don't worry that you'll be constantly dragging zone boundaries back and forth for every shot you grade. Generally speaking, most well-photographed scenes have similar ranges of image tonality in each shot, so zone boundaries that have been customized for one shot from that scene will likely be good for most clips in that scene. That said, adjusting zone boundaries is another powerful way of tailoring a grade specifically for a clip with a unique range of contrast.

Zone Controls

- **(Min/Max) Range:** Defines the level of image tonality at which that zone's adjustment starts. This value is expressed in stops.
- **Falloff:** Adjusts how softly the adjustment in that zone will blend into the image. A value of 0 results in an immediate transition to the adjustment created in the current zone, with the color adjustment being a sharper effect. Higher values will blend the current zone's adjustment into the image more softly, resulting in a more gentle and seamless transition into the effect.

Customizing and Saving Presets

If you've customized the Zone graph in a way that's potentially useful for other grading situations, you can save a preset of the Zone settings for future use. Saving, recalling, and managing these presets is simple.

Methods of managing presets:

- **To save a preset:** Customize the Zone graph to suit your needs, then choose Save As New Preset from the HDR Palette option menu.
- **To load a preset:** Choose Presets > Name of Preset > Load Preset from the HDR Palette option menu. A new preset will be saved.
- **To update a preset:** Load a preset, make any changes you need to from the Zone graph, and then choose Presets > Name of Preset > Update Preset from the HDR Palette option menu.
- **To delete a preset:** Choose Presets > Name of Preset > Delete Preset from the HDR Palette option menu.

Resetting Color and Zone Adjustments

In the HDR palette's Option menu, there's a Reset submenu with three commands, Reset All, Reset Color Adjustments, and Reset Zone Definitions, which are self-explanatory. These are important because, during the course of developing a grade, there will be many times when you'll want to reset your color adjustments without changing how you've customized the zone graph, or vice versa.

Additionally, each of the visible reset buttons in the GUI can be used with keyboard modifiers to specifically target what to reset. The master reset button in the HDR palette's title bar resets the entire palette when clicked (similar to the Reset All command). However, using keyboard modifiers while clicking this button changes what's reset.

- Hold down Command+Shift while clicking the master reset button to reset only the Zone graph's Range and Falloff controls, without resetting your color adjustments.
- Hold down Command+Option while clicking the master reset button to reset only the color adjustments, while leaving the zones alone.

Both of these modifiers also work with the zone-specific reset controls found in the Wheels panel, letting you reset only the zone controls or only the color controls of each specific zone.

Using the HDR Palette With DaVinci Control Panels

To use the HDR palette with the DaVinci Advanced Control Panel, press SHIFT + AUTO COLOR. All of the current control mappings will appear in the center panel soft buttons and rotaries, and the trackballs and control rings will be mapped to the appropriate zones. The < and > soft keys let you navigate among all the zones available in the current preset.

To use the HDR palette with the DaVinci Mini Control Panel, press the USER button, then press the HDR soft button above the left-hand display. All of the HDR palette control mappings will appear in the soft knobs and keys, and the trackballs and control rings will be mapped to the color balance and exposure controls of the appropriate zones. The PREV ZONE and NEXT ZONE soft keys let you navigate among all the zones available in the current preset.

Color Warper

The Color Warper palette is a mesh-based warping tool that, instead of warping the spatial location of pixels, warps one set of colors into another. Better yet, unlike the HSL curves, the Color Warper lets you simultaneously adjust two color parameters at the same time, within user-selectable regions of specific hues. These adjustments, made using a grid of draggable control points, automatically have a smooth falloff from the colors you're warping to other colors that are locked into place. The smoothness of this falloff depends on the distance between the warp points that are being adjusted and other warp points that are locked in place to prevent change.
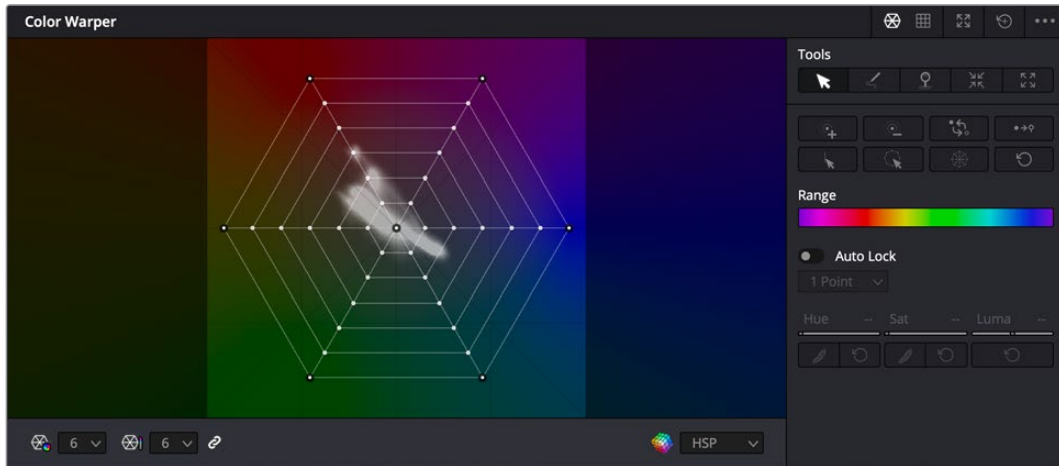
The Color Warper, located in the center palette area

There are two ways you can use this tool. You can drag the control points in the grid to make highly specific image adjustments. More intuitively, you can click to sample the image, which selects the closest grid point that affects that color, and then drag to make an adjustment with that control point.
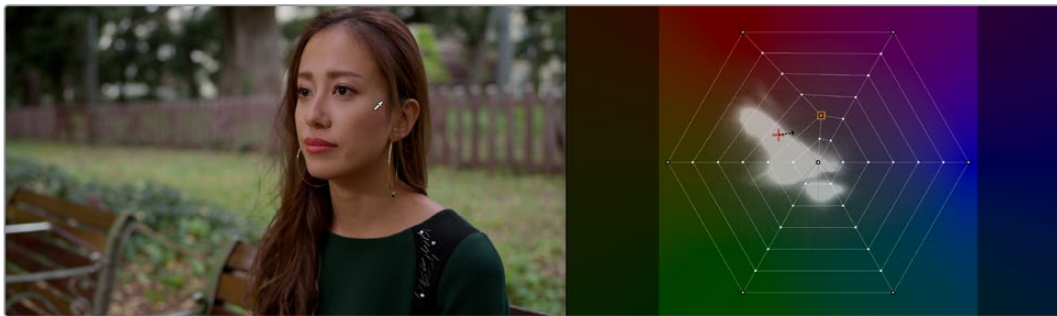
Clicking and dragging to sample skin tone in the Viewer to adjust
that color's control point on the Hue-Saturation warping grid

You can use this tool to make extremely specific adjustments to colors in an image, similar to what you might do with a Qualifier key or with the HSL curves. However, by warping the points using a grid, you can manipulate two color characteristics at the same time, adjusting both Hue and Saturation, or Chroma and Luma. In the following example, specific adjustments are being made to refine the man's shirt, to adjust his skin tone, and to manipulate the greens of the foliage in the shot. All three of these naturalistic adjustments are smooth and artifact-free by virtue of the Color Warper's method of cleanly remapping color.
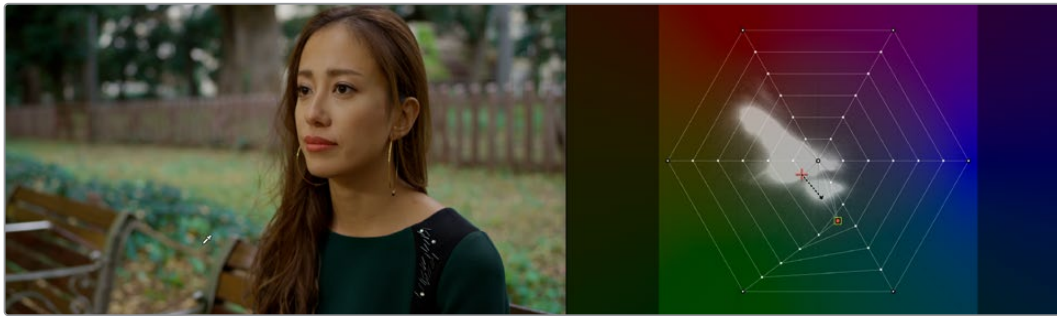
(Top) The original image, (Bottom) Manipulating the hue and saturation of the grass using the Chroma-Luma controls

You can also use this tool to create wide-ranging stylistic looks for the overall image, bending the color in creative ways that other controls don't. In the following image, the less saturated and neutral colors of the image are all warped towards a bluish-cyan, while the more saturated oranges are warped towards a saturated orange-red, to quickly create a stylistic treatment of the image.
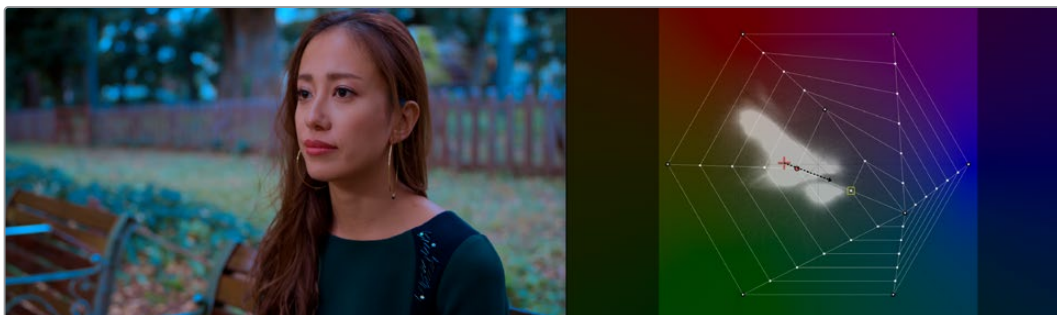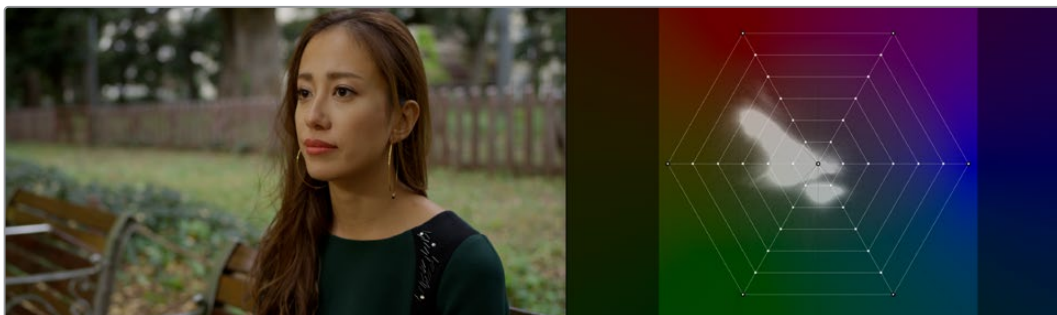
(Top) The original image, (Bottom) Stylizing the overall image using the Hue-Saturation controls

The Color Warper Interface

You can either use the Color Warper as it appears docked into the middle palette area, or you can click the Expand button to open the Color Warper into a floating window that you can make as large as you like, giving you more detailed control of dense grids of control points. For convenience, the examples in this chapter show the Color Warper side by side with the Viewer, in a floating window. While the Color Warper is open in its own window, the Color Warper palette button in the toolbar turns into a "re-docking" button, clicking it puts the palette back in the palette area below.

(Left) Clicking the Expand button opens the Color Warper into a floating window,
(Right) Clicking the Re-docking button in the palette toolbar puts the palette back

There are two overall regions of the Color Warper palette. At the left, the grid area has the actual warping grid with points you manipulate to make adjustments, while controls underneath let you choose the resolution of the grid and the color space in which it works. At the right, the control area provides all the tools, range controls, and feathering controls that are available for manipulating the warping grid in a variety of highly specific ways.

Using the Grid Controls to Manipulate Color

This palette has two modes; each lets you manipulate the colors of the image in different ways, and each has a different style of grid used for warping the different color channels that are affected. Learning how to manipulate the color warping points of each of these grids is central to understanding how this palette works.
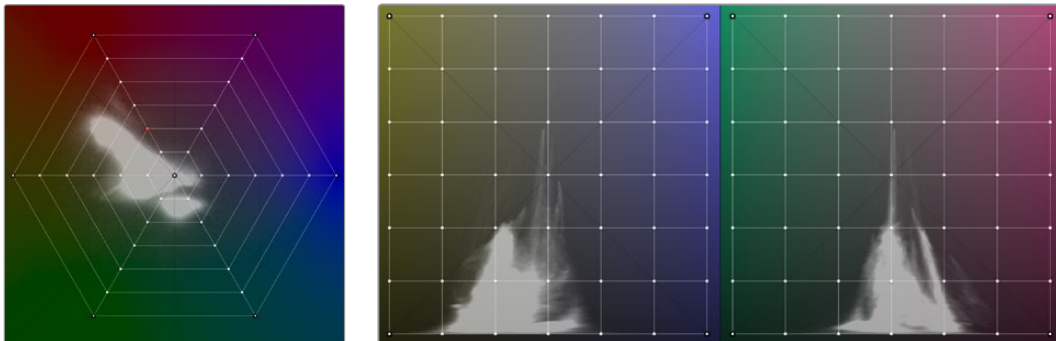
(Left) The radial grid in Hue-Saturation mode, (Right) The two rectangular grids in Chroma-Luma mode

Dragging to Warp Colors

Despite the different shapes, each of these grids are manipulated in similar ways. Dragging a control point alters whatever color corresponds to that point, while the colors that surround this dragged point are also adjusted proportionally according to their location between the point being dragged and surrounding points that either (a) aren't affected, or (b) are locked into place. Locked points prevent the colors at those points from being changed. By locking some parts of a grid and dragging other parts, you can create sophisticated hue-specific adjustments.
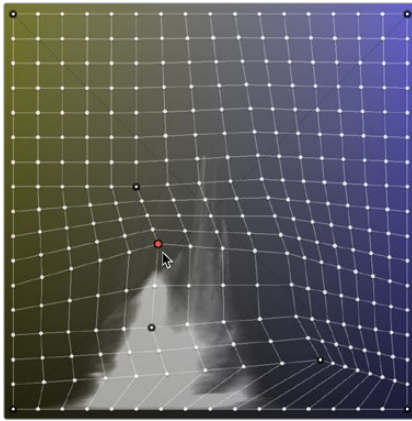
The orange control point has been selected and dragged to make an adjustment. Control points with black outlines are locked in place and help prevent control points on the opposite side from being moved. All other control points between the selected and locked control points are stretched or squished depending on the selected point's adjustment.

The image above shows the three states of control points in the grid:

- **Orange:** Selected points appear orange. You can select multiple points by Command-clicking multiple points, by dragging a bounding box over multiple points, or by using the draw selection tool to click and draw over any points you want to select. Once you've selected and moved a control point, it becomes locked to keep that adjustment in place.
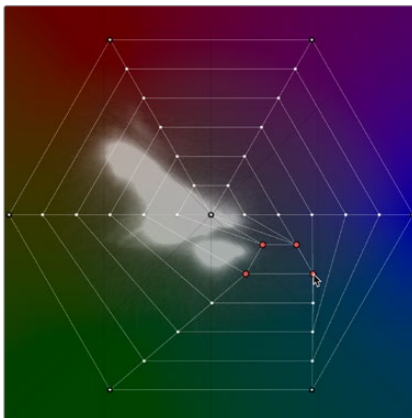
Selected points appear orange; in this example four points are selected to move them all together

- **Outlined:** White control points with a black outline are locked. Locked points do not move automatically when nearby points are dragged, so locked points are important for preventing specific colors you don't want altered from being changed, as well as for saving changes to points that you've adjusted. All adjusted points become locked. The outer corners of the Chroma-Luma grid are locked, as is the outer ring and center point of the Hue-Saturation web.
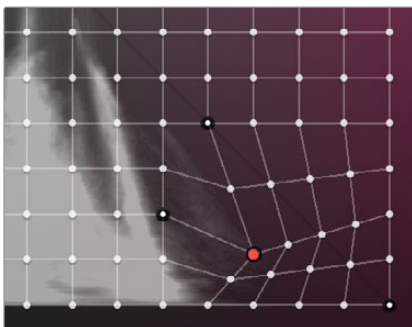
Locked points with black outlines keeping other colors in the image from being adjusted by the selected point

- **White:** White control points are neither selected nor locked, and will be stretched or squished when adjacent control points are moved.
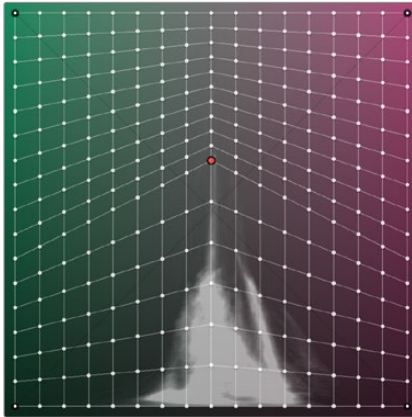
Unlocked control points between a selected point and locked points (in this case the corners of the grid) will squish and stretch to warp an entire range of color as you drag

While control points work much the same in either the Hue-Saturation or Choma-Luma modes, there are some important differences. The radial "spokes" of the Hue-Saturation wheel don't influence neighboring spokes, so any adjustment you make to a control point on one spoke only affects the colors that fall between it and the two neighboring spokes that surround it. This means it's not necessary to lock control points on neighboring spokes of this wheel-shaped grid to prevent them from changing.
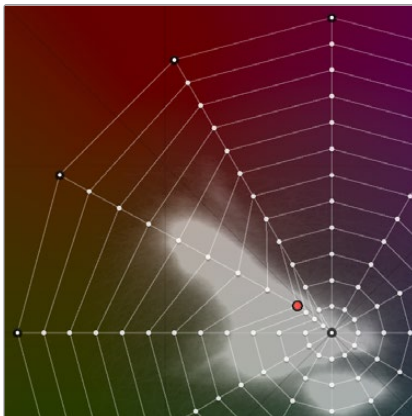
Adjustments made to control points on one "spoke" of the Hue-Saturation wheel grid don't affect those on neighboring spokes, which act as if they're locked, even though they're not

Both the Hue-Saturation and Chroma-Luma warper grids lock the outer boundary of the grid. You can still drag these points to adjust them, but they can't be unlocked and they won't move automatically when you adjust other control points. The Hue-Saturation grid has an additional point locked right in the center, which keeps the neutral colors (black through gray and white) neutral.

> **TIP:** Dragging the locked center point of the Hue-Saturation grid lets you alter the color of the white point, while proportionally warping all other colors in the image to smoothly accommodate this change. This can be the starting point of a lot of different looks.

Previewing Which Colors Are Warped By Each Control Point

If you press and hold the Option key while you click on a control point in the warp grid, you get a preview in the Viewer of which colors that control point will affect. Affected pixels appear in color against black, which represents all pixels that will remain unaffected by that control point.

Holding the Option key down while clicking a Color Warper control point shows a preview of affected pixels against black

Sampling to Warp Colors

While it's important to learn how control points in the grid are manipulated, the most intuitive way of working with this control is to use the pointer to click within the Viewer to sample a color you want to adjust, hold the pointer button down, and then drag to adjust the color.

When moving the pointer in the Viewer, you'll see a crosshairs moving around the warping grid that shows you the exact color on the vectorscope graph, while a yellow box indicates the control point that's closest to the color you're sampling that will be selected if you click. In the following example, positioning the eyedropper over the sky shows that clicking will select a control point close to the center of the grid.
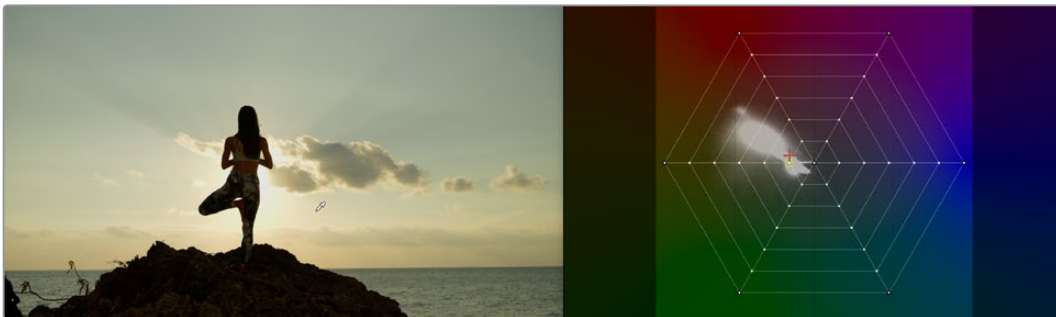
Moving the pointer in the Viewer shows a preview in the warping grid of which control point you'll select were you to click

Clicking and dragging selects and then moves the control point corresponding to that color in the Viewer. As you drag the pointer, you'll see the selected control point move in the same direction as the mouse while the colors of the image update in real time to show the adjustment you're making. Meanwhile, an arrow in the grid shows you the delta of the current adjustment. Moving a selected control point to another hue in the grid warps the original color to the new color.
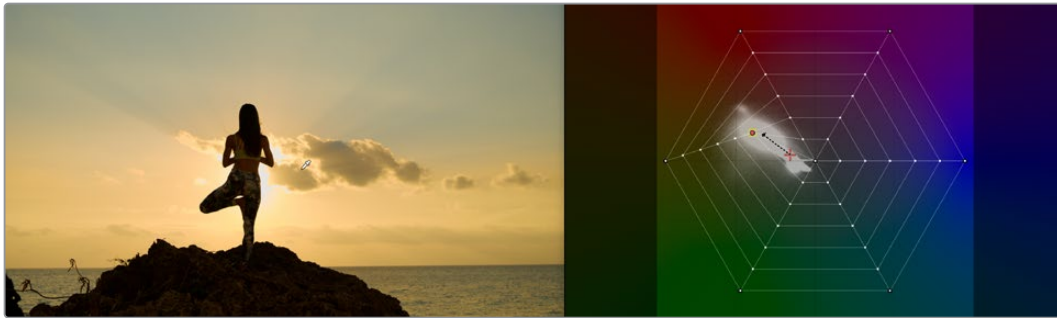
Clicking and dragging moves the control point corresponding to that color in the grid to adjust the color and locks it into place

You can also lock control points by sampling the image. Hold the Command and Shift keys down, and then click on the color or colors you want to lock in the warp grid to prevent them from being changed. This makes it easy to work directly in the Viewer to lock colors you don't want to change, before adjusting other colors that you do want to change.

In the following example, Command-Shift-clicking on the woman's shoulder locks the yellowish highlights falling on her uniform in place. Then, clicking and dragging a highlight on her face lets us push the highlights towards teal without losing the warmer highlights on her shoulder, all by sampling directly in the Viewer.

(Top) Command-Shift-clicking to lock the closest control point to a color on the warping grid you don't want to change, (Bottom) Warping a neighboring color while the control point you just locked keeps that part of the image from changing

Resetting Grid Points

If, at any point, you adjust a point that you want to reset, simply right-click on that point to de-lock and reset it.

Grid Resolution Affects The Specificity and Quality of Adjustments

You can change the resolution of the grids in either Hue-Saturation or Chroma-Luma modes, using the controls at the bottom of the Color Warper palette, underneath the grid itself.

Separate drop-down menus let you choose the resolution of control points for Hue and Saturation, or for Chroma and Luma separately, although by default they're linked together.

The two resolution controls found underneath the grid controls

By default, the Hue-Saturation grid has a resolution of 6x6, which is the lowest resolution available. The Chroma-Luma grid defaults to 6x6, but can be set lower, to 4x4. Low resolution warping grids make it easy to create broad color adjustments affecting large ranges of analogous color with smooth results. Additionally, lower quality media that's 8-bit, with 4:2:0 chroma subsampling, and/or highly compressed benefits from lower resolution warping grids to avoid artifacts and keep color adjustments smooth.
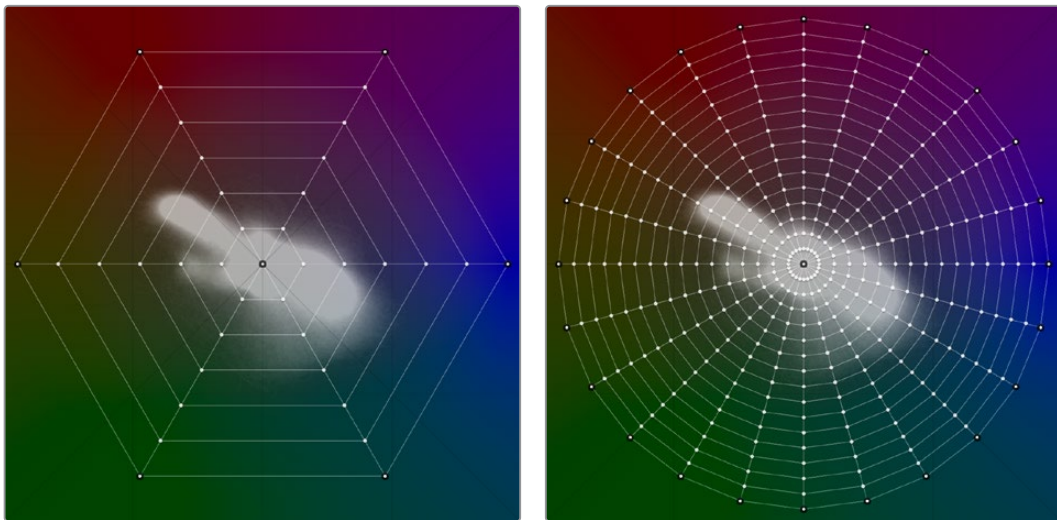
(Left) The Hue-Saturation grid set to a resolution of 6x6,
(Right) The Hue-Saturation grid set to a resolution of 24x16

On the other hand, higher resolution grids let you make more specific adjustments to tighter ranges of color. However, this approach is more useful in projects using high quality media (10- or 12-bit, 4:2:2 or 4:4:4 chroma subsampling, and minimally compressed) to avoid unwanted artifacts. If you're using high-quality media, you'll find you can use the Color Warper to make incredibly specific adjustments.
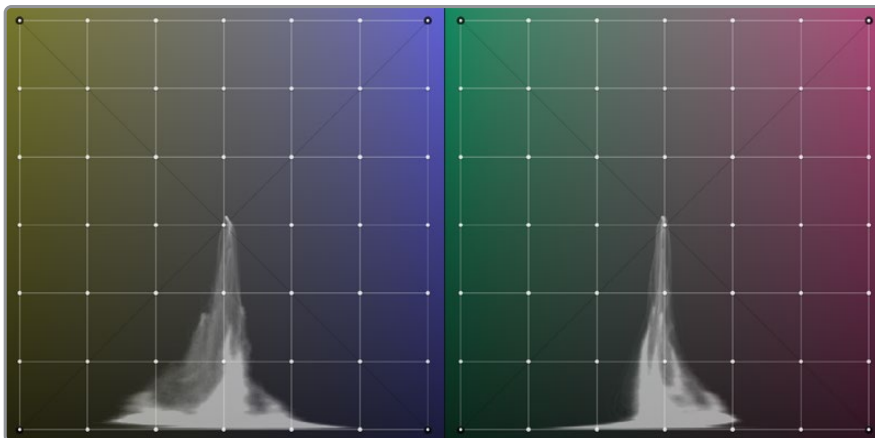
The Chroma-Luma grid set to a resolution of 6x6
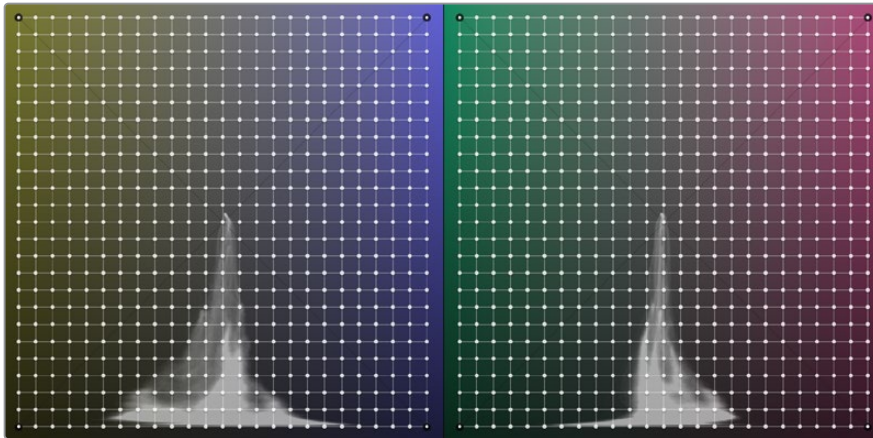
The Chroma-Luma grid set to a resolution of 24x24

NOTE: If you make adjustments with the grid at one resolution, it's possible to change the grid to a higher or lower resolution and your adjustment will be interpolated to fit the new grid resolution, although the resulting adjustment may change a bit.

You Can Warp Color in Different Color Spaces

A drop-down menu at the bottom right of the warping grid lets you choose which color space to use for manipulating the colors of the image. Different color spaces project the colors of the image into the two-dimensional warping grid in different ways, and some may make it easier to manipulate a particular image in the way you want by spreading out different ranges of color more widely.

The color space found underneath the grid controls

The available color spaces are:

- **HSV**
- **HSL**
- **HSY**
- **HSP**

Hue — Saturation Controls

As the name implies, the Hue-Saturation mode lets you alter hue and saturation simultaneously. For most people, this is likely the most intuitive mode in which to work as the range of hues and saturation in the image is represented radially, just like the Vectorscope; in fact a Vectorscope graph of the image appears underneath the "wheel" grid of control points used to manipulate color.

By default, dragging any point of this grid changes the colors immediately surrounding that point that are between the point being manipulated and adjacent "spokes" of the radial grid that either aren't influenced by that point, or are locked into place. In fact, you can pull these radial control points well past the boundary of adjacent spokes of the grid to warp those colors to entirely different hues.
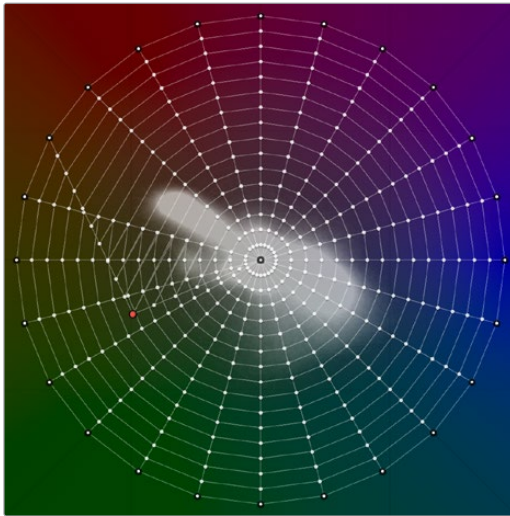
The selected control point being adjusted doesn't affect points on adjacent columns of control points that stretch from the outer ring to the center of this control, even when the dragged point is moved all the way past

When manipulating control points to alter color, adjustments are similar to pushing color around a color wheel. Moving a control point radially around the circumference of the grid changes the hue of the colors corresponding to that control point. Moving a control point closer to the center desaturates those colors, while moving a control point closer to the edge of the grid increases the saturation of those colors.

The following sections describe how the different tools available in this mode work to let you manipulate these radial control points in different ways.

Tools

Each of the available tools let you manipulate control points on the warping grid in different ways when you click on them.

- **Selection Tool:** The default tool mode. Selecting this tool lets you select control points either individually (by clicking on a single point or command-clicking multiple points) or collectively by dragging a bounding box over multiple points, and you can right-click on control points to de-select, unlock, and reset them. You can also Shift-click with this tool to lock points into place without moving them. This is the most useful tool to use when manipulating the image by clicking and dragging in the Viewer to sample a color and adjust it at the same time.

- **Draw Selection:** Selecting this tool lets you make a selection of control points by clicking and dragging to draw over all the points you want to select. This is good for making large but specific selections of points.

- **Pin/De-Pin:** Selecting this tool lets you pin multiple control points by either clicking on them or by clicking and dragging to draw over all the points you want to pin/de-pin.

- **Pull Points:** Selecting this tool lets you make adjustments by clicking anywhere on the warp grid, even between points, to pull all neighboring control points towards where you clicked. This can be used to reduce color contrast within a specific range of colors.

- **Push Points:** Selecting this tool lets you make adjustments by clicking anywhere on the warp grid, even between points, to push all neighboring control points within a particular proximity away from where you clicked. This can be used to increase color contrast within a specific range of colors.

Modifiers

Each of the modifier buttons let you manipulate selections and selected control points on the warping grid in different ways immediately upon clicking each button.

- **Increase Falloff/Smooth Selection:** If you've selected one or more control points, clicking this button expands the selection to include all adjacent control points surrounding the selection.
- **Decrease Falloff/Smooth Selection:** If you've selected a group of control points, clicking this button shrinks the selection by deselecting the outermost ring of selected control points, leaving the inner control points selected.
- **Invert Selection:** Clicking this button selects all unselected control points, and de-selects all selected control points. This is useful when you want to make separate color adjustments to both specifically selected halves of the warping grid.
- **Convert Selection to Pin:** Clicking this button pins all currently selected control points.
- **Select/Pin Column:** If you have one or more control points selected, clicking this button expands the selection to include all points on every column that have at least one selected point.
- **Select/Pin Ring:** If you have one or more control points selected, clicking this button expands the selection to include all points on every ring around the center that have at least one selected point.
- **Select/Pin All, Deselect/Pin All:** Clicking this button toggles the selected state of the entire warping grid on or off.
- **Reset Selection/Pins:** If you have one or more control points selected, clicking this button resets their position to the original default position in the warping grid, without de-selecting them.

Range

The Range control is a fast method of selecting multiple control points corresponding to a specific range of colors.

- **Range:** A gradient shows the range of hues currently being presented in the warping grid. Dragging the left and right handles of the Range control selection box lets you automatically select all control points corresponding to the hues that appear within the selection box. This is a fast way of selecting all points within a range of colors for uniform manipulation.

Auto Lock Controls

The Auto Lock controls enables DaVinci Resolve to automatically lock a border of control points surrounding any control point you select and adjust, which makes highly-specific color adjustments easier to accomplish.

- **Auto Lock:** Enables and disables this behavior.
- **X Points Border:** Lets you set how many points away from the control point you're adjusting the border of locked control points that restricts your adjustments is. How large an area this ends up being depends on how many points you choose, and on the resolution of the warping grid. At higher grid resolutions, the same points distance isolates a smaller region of color.

Smoothing Controls

The smoothing controls let you "ease off" an adjustment you've made by progressively moving one or more selected control points towards their original default position in the warping grid.

- **Smooth Chroma:** Each click of this button rotates the angle of selected control points around the circumference of the circular warping grid towards their original position, bringing the hue of the adjusted colors closer and closer to the original hues of the image. Saturation is unaffected.

- **Reset Chroma:** Resets the angle of all selected control points to the original hues of those control points. Saturation adjustments are unaffected.
- **Smooth Saturation:** Each click of this button moves the position of a control point closer to its original position relative the center of the circular warping grid, thus bringing the saturation at that point closer to the original image saturation of the node's input. Hue is unaffected.
- **Reset Saturation:** Resets the distance from the center of all selected control points to the original image saturation at those control points.
- **Reset Luma:** Resets Luma to the original image values.

Chroma — Luma Controls

The Chroma-Luma mode lets you alter the hue and lightness of colors in the image simultaneously. This may not feel like a particularly intuitive way of working, as the grid controls are overlaid on colors projected as different sides of an RGB cube. However, this enables some powerful adjustments once you get the hang of how multiple adjustments interact in this mode, as well as the power of locking control points to limit your adjustments to specific areas of the two grids.

Whether you're sampling the image or manipulating the control points of this grid directly, dragging any point of this grid changes the color of the image corresponding to that point. Vertical adjustments change lightness, where up makes that part of the image lighter, and down makes that part of the image darker. Horizontal adjustments change hue, depending on which range of hues are shown in the two Chroma-Luma warping controls, and which of these you're adjusting.

By default, only the outer four corners of this control are locked, so any adjustment you make to any control point pushes and pulls all the other colors throughout the image, depending on your adjustment. Working this way, multiple adjustments to multiple colors gradually pins different colors into place, with each adjustment warping the colors falling in between to maintain a smooth transformation from one adjustment to the next. This can be a good way to make an overall stylistic adjustment to the image.
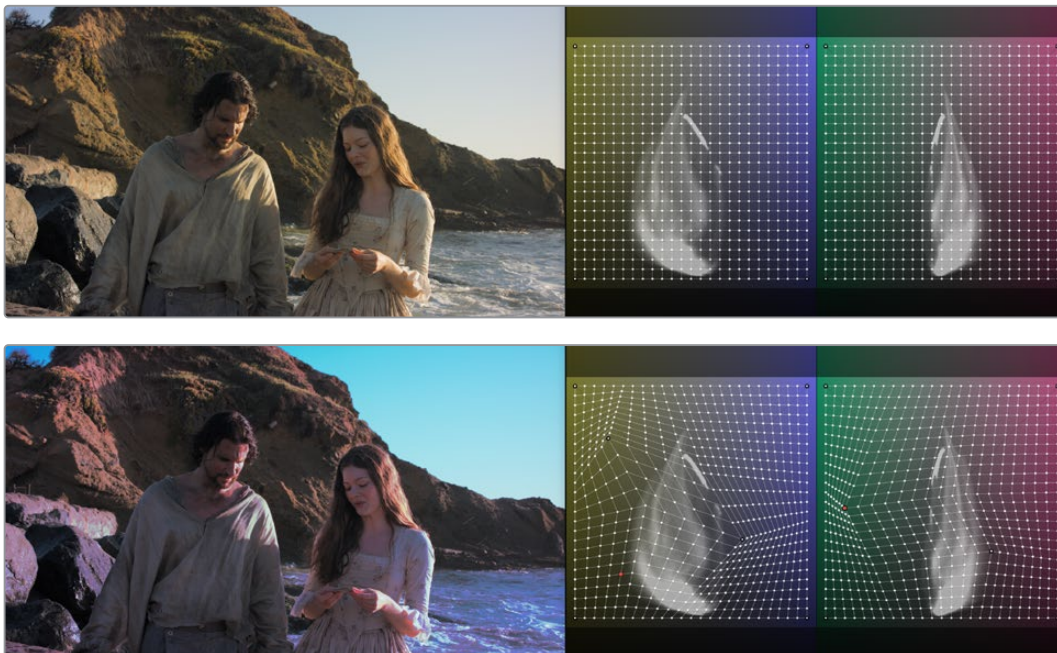
(Top) The original image, (Bottom) The result of making multiple interacting color adjustments across the entire Chroma Luma grid

Another approach to using this mode is to make more targeted corrections by manually locking different colors in the image that you don't want to adjust. You can do this by using the Selection tool and Shift-clicking any value in the Viewer, or by Shift-clicking any control point on the grid control. By locking colors you don't want to change, you can focus on manipulating a more specific range of colors without altering the entire image.

Alternately, this is where the Auto Lock controls really shine. When you turn these on, you can choose the type of region you want to affect (vertical column, horizontal row, or a square region), then choose how large a region of color you want to manipulate (one or two points away from the point that's selected). Keep in mind that the current resolution of the warping grid also has an effect on how large the resulting region of color will be. Lower resolution grids will let you manipulate larger regions of color, while higher resolution grids will let you adjust a more narrow range of color.

The Auto Lock controls let you make highly targeted adjustments to specific sections of the warping grid

Once these controls are enabled, simply clicking once on the image or warping grid selects a control point and automatically locks off the region of the grid you want to focus your adjustment on. In the following example, a medium-resolution grid is used in conjunction with the Auto Lock controls set to lock a 2 point rectangular region. So, clicking on the skin of the woman's face and dragging adjusts a section of available reds within the locked-off region of the grid.
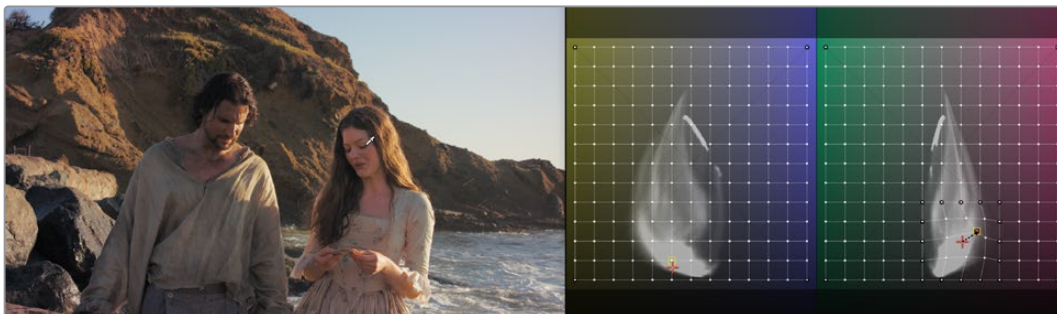
Making a targeted color adjustment to a locked-off region of the Chroma Luma grid

The following sections describe how the different tools available in this mode work to let you manipulate these radial control points in different ways.

Axis Angle

When you're in Chroma-Luma mode, an additional control appears underneath the warping grids, a slider named Axis Angle. Dragging this slider to the left or right changes the range of hues in each of the two warping grids that's presented. Letting you manipulate different ranges of color.

Tools

Each of the available tools let you manipulate control points on the warping grid in different ways when you click on them.
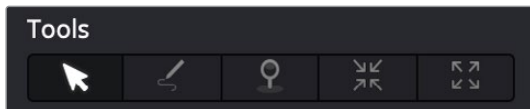
The Tools buttons

- **Grid 1/Grid 2 tabs:** Since the Chroma-Luma controls expose two grids representing two different ranges of Hue and Luma, these two tabs let you choose which grid will be manipulated when you sample the image in the Viewer, as well as which grid the Tools controls affect.

- **Selection Tool:** The default tool mode. Selecting this tool lets you select control points either individually (by clicking on a single point or command-clicking multiple points) or collectively by dragging a bounding box over multiple points. You can also Shift-click with this tool to lock points into place without moving them, and you can right-click on control points to de-select, unlock, and reset them. This is the most useful tool to use when manipulating the image by clicking and dragging in the Viewer to sample a color and adjust it at the same time.

- **Draw Selection:** Selecting this tool lets you make a selection of control points by clicking and dragging to draw over all the points you want to select. This is good for making large but specific selections of points.

- **Pin/De-Pin:** Selecting this tool lets you pin multiple control points by either clicking on them or by clicking and dragging to draw over all the points you want to pin/de-pin.

- **Pull Points:** Selecting this tool lets you make adjustments by clicking anywhere on the warp grid, even between points, to pull all neighboring control points towards where you clicked. This can be used to reduce color contrast within a specific range of colors.

- **Push Points:** Selecting this tool lets you make adjustments by clicking anywhere on the warp grid, even between points, to push all neighboring control points within a particular proximity away from where you clicked. This can be used to increase color contrast within a specific range of colors.

Modifiers

Each of the modifier buttons let you manipulate selections and selected control points on the warping grid in different ways immediately upon clicking each button.

The Modifiers buttons

- **Increase Falloff/Smooth Selection:** If you've selected one or more control points, clicking this button expands the selection to include all adjacent control points surrounding the selection.

- **Decrease Falloff/Smooth Selection:** If you've selected a group of control points, clicking this button shrinks the selection by deselecting the outermost ring of selected control points, leaving the inner control points selected.

- **Invert Selection:** Clicking this button selects all unselected control points, and de-selects all selected control points. This is useful when you want to make separate color adjustments to both specifically selected halves of the warping grid.

- **Convert Selection to Pin:** Clicking this button pins all currently selected control points.

- **Select/Pin Column:** If you have one or more control points selected, clicking this button expands the selection to include all points on every column that have at least one selected point.
- **Select/Pin Row:** If you have one or more control points selected, clicking this button expands the selection to include all points on every row that have at least one selected point.
- **Select/Pin All, Deselect/Pin All:** Clicking this button toggles the selected state of the entire warping grid on or off.
- **Reset Selection/Pins:** If you have one or more control points selected, clicking this button resets their position to the original default position in the warping grid, without de-selecting them.

Range

The Range control is a fast method of selecting multiple control points corresponding to a specific range of colors.

The Range control

- **Range:** A gradient shows the range of hues currently being presented in the warping grid. Dragging the left and right handles of the Range control selection box, or dragging within the range control to set both boundaries, lets you automatically select all control points corresponding to the hues that appear within the selection box. Once you've set a range, you can move the range to the left and right by dragging the center of the selection. This is a fast way of selecting all control points within a range of colors for uniform manipulation.

Auto Lock Controls

The Auto Lock controls enables DaVinci Resolve to automatically lock a border of control points surrounding any control point you select and adjust, which makes highly specific color adjustments easier to accomplish. These are particularly useful in the Chroma-Luma warping grid.

The Auto Lock controls

- **Auto Lock:** Enables and disables this behavior.
- **X Points Border:** Lets you set how many points away from the control point you're adjusting the border of locked control points that restricts your adjustments is. How large an area this ends up being depends on how many points you choose, and on the resolution of the warping grid. At higher grid resolutions, the same points distance isolates a smaller region of color.
- **Lock Column:** Lets you choose to restrict your adjustment to affect all control points within a particular column of the rectangular Chroma-Luma graph. The width of this column is defined by the border width controls. This is useful when you want to primarily adjust the lightness of a range of colors, while making a small adjustment to hues.

- **Lock Row:** Lets you choose to restrict your adjustment to affect all control points within a particular row of the rectangular Chroma-Luma graph. The height of this row is defined by the border width controls above. This is useful when you want to primarily adjust the hue of a range of colors, while making a small adjustment to lightness.
- **Lock Region:** Lets you choose to restrict your adjustment to affect all control points within a rectangular region surrounding the selected point. The is useful when you want to adjust a targeted region of color that corresponds to a well-defined feature of the image, such as a specifically colored hat, shirt, foliage, or skin tone. Smaller regions will make more specific adjustments than larger regions.

Smoothing Controls

If you've found that you've gone a bit too far with an adjustment and need to back off a little bit, the Smooth controls let you do so gradually, or start over if necessary.
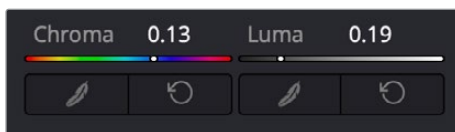
The Smoothing controls

- **Smooth Chroma:** Each click of this button moves selected control points left or right, back towards their original position, bringing the hue of the adjusted colors closer and closer to the original hues of the image. Luma is unaffected.
- **Reset Chroma:** Resets the position of all selected control points to the original hues of those control points. Luma adjustments are unaffected.
- **Smooth Luma:** Each click of this button moves selected control points up or down, back towards their original position, bringing the luma of the adjusted colors closer and closer to the original luma of the image. Chroma is unaffected.
- **Reset Luma:** Resets the position of all selected control points to the original luma of those control points. Chroma adjustments are unaffected.

Magic Mask

The Magic Mask palette uses the DaVinci Neural Engine to automagically create a mask to isolate one or more people in the frame, guided by user-applied paint strokes to identify the subject for isolation. Masks can be generated for either an entire person, or for specific features of that person (their face, hair, arms, shoes, etc.). The following images show these two kinds of masks with Highlight enabled in the Viewer. A red onionskin overlay lets you see what Magic Mask is isolating.

(Left) Using Magic Mask to isolate an entire person, (Right) Using Magic Mask to isolate someone's face

Once the Magic Mask palette has generated a mask, Matte Finesse controls let you adjust the mask's size and feathering. This lets you deal with difficult edges that might tip your hand depending on the kind of adjustment you're trying to make.

While the masks generated by Magic Mask can often be good enough to use directly for making high quality isolated adjustments, it won't always give perfect results. Keep in mind that Magic Mask is as much for the fast creation of detailed garbage masks as it is for doing direct isolation.

In these cases, the Matte Finesse controls let you make the resulting mask softer and looser as necessary to clear the edge of a difficult subject you're isolating with the help of another mask generation technique, such as a Qualifier key or window. When you use the Magic Mask palette within the same node in which you're also creating a key in the Secondary palette, or a window in the Window palette, the key or window and Magic Mask are combined to output a boolean intersection. This means the isolation is limited to areas where both kinds of masks overlap one another.

(Left) Using Magic Mask to create a mask, (Right) Combining the Magic Mask with a circular window, the resulting mask is an intersection of the two

If you're isolating specific features of a person, you can also mix and match what you're isolating to create exactly the type of mask you require. For example, you might isolate the face, along with exposed skin on the torso, arms, and legs, to create a mask for creating an overall skin tone adjustment that doesn't include the subject's hair or clothes.

(Left) Using Magic Mask to isolate a face, (Right) Using Magic Mask to isolate all exposed skin

As described earlier, this whole process is guided by strokes you draw to identify the subject. In a typical workflow, you'll draw short positive strokes (colored blue) over the person or feature you want to isolate. Then, if necessary, you can also paint short subtractive strokes (colored red) over parts of the image that are not the person or feature you're isolating, to correct any problems you see in the generated mask.

Blue strokes identify a person or feature to isolate, while red strokes identify things that shouldn't be included in the mask

Ideally, both positive and subtractive guidance strokes should be relatively short, and centered on the part of the person you're trying to add to the mask. Stroke position is usually more important than stroke length, and in fact if you don't like the result you're getting in the mask with a particular stroke you've drawn, you can drag it to another position without redrawing it; strokes are live and can be selected using the pointer to move or delete them.
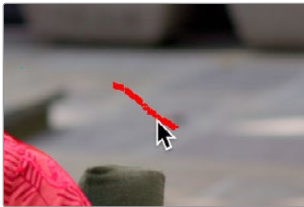
Selecting a stroke with the pointer; selected strokes become highlighted

Very long paint strokes aren't usually that useful, and can be counterproductive later on when you're trying to track strokes to follow motion in the clip. This is particularly true if a stroke needs to follow something that's changing shape as it moves, like an arm. Furthermore, while you can make as many strokes as you like, fewer strokes work better than many strokes, and as a general rule you shouldn't use more than five strokes to isolate a particular person or feature (nor should you need to).

As you work, each stroke shows up in the Stroke list, which lets you select, enable/disable, delete, and otherwise manage the different strokes you create to guide automatic mask generation.
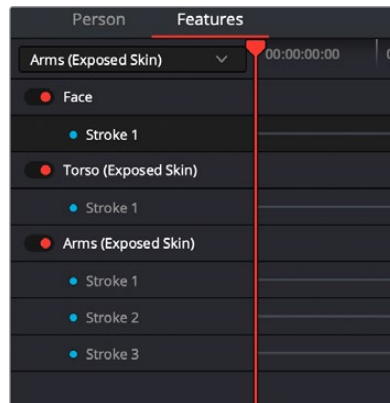
(Left) Multiple strokes in Features mode isolating exposed skin, (Right) The Stroke list keeps track of all strokes you've made

But what about camera and/or subject motion, you ask? After you've painted one or more strokes to guide the analysis, you can motion track these strokes to follow the subject throughout that shot using the stroke tracking controls within this palette. If you've made multiple strokes, they're all tracked at once, and each stroke automatically follows along with whatever image details immediately surround that stroke, so there's no setup necessary. You simply draw one or more strokes, then click the track forward or backward button. When you track a stroke, the tracking bar for that stroke in the Stroke list shows you which frames have been tracked (tracked frames are blue).
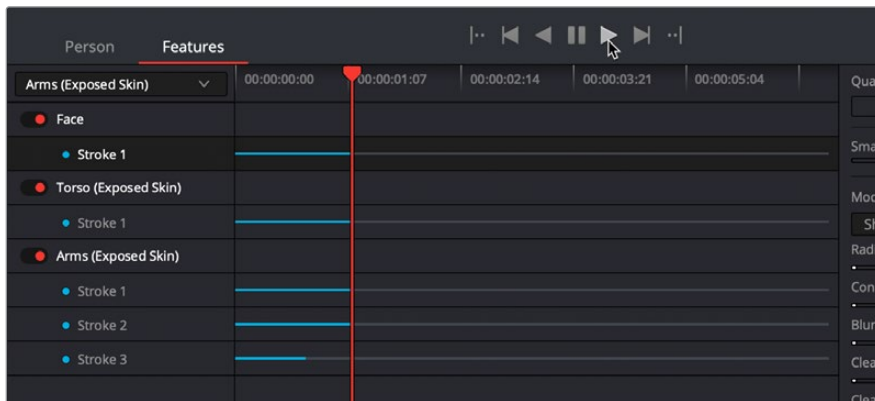
Controls let you track all mask analysis strokes forward and backward through the shot

Once you've added the strokes that are necessary to isolate the subject, and you've motion tracked them to follow along with the motion of the shot, a mask is automatically generated live for each frame of the shot. This is important to know because any change you make, adding or removing strokes or moving them manually, will alter the resulting mask on the fly.

What Magic Mask Is Good For, and What It's Not

Keep in mind that the Magic Mask tool does not specialize in soft translucent mask edges, such as those created by the HSL, Luma, or 3D Keyers (when they're used carefully). On the other hand, it excels at creating form-fitting masks that isolate human features in situations where a typical keyer does poorly. For example, Magic Mask can isolate exposed skin in shots where that person is standing in front of a background with wood, stone, or soil that inhabits the same ranges of color as that person. It can isolate beige clothes against a beige background. It can even isolate a person within a black and white clip.

Once you've drawn one or more strokes to isolate a mask, a variety of controls let you adjust the resulting mask to better fit the subject, if necessary. Depending on the adjustment you're making to the subject at hand, you may find that the keys generated using Magic Mask are sufficient to convincingly isolate the person you're grading, particularly if you're working in Better mode.

However, real world projects pose plenty of unexpected challenges. Keep in mind that, depending on what you're trying to do, the resulting automated mask isn't always going to be perfect enough to replace precise rotoscoping for intensive secondary color adjustments. However, it's been designed to easily create tight-fitting garbage masks to use in conjunction with secondary keys or windows, with which to exclude the background around a difficult-to-isolate subject.

If you're using Magic Mask to create a garbage mask, keep in mind that the Faster mode has been optimized to create looser masks more quickly for situations where you'll be using it in conjunction with a keyer or window to isolate a specific area for special grading.

> **TIP:** The Magic Mask palette can even isolate people in photos and paintings. However, figurative representations must have a minimal level of shadow rendering and anatomical detail for a figure or feature to be recognized. For this reason, cartoony or abstract representations won't isolate very well.

The Magic Mask Interface

The Magic Mask palette is divided into three sets of controls: the Toolbar, the Stroke list, and the Mask Finesse panel. When you first open the Magic Mask palette, it's empty, and you're told to draw a stroke in the Viewer to create a mask.
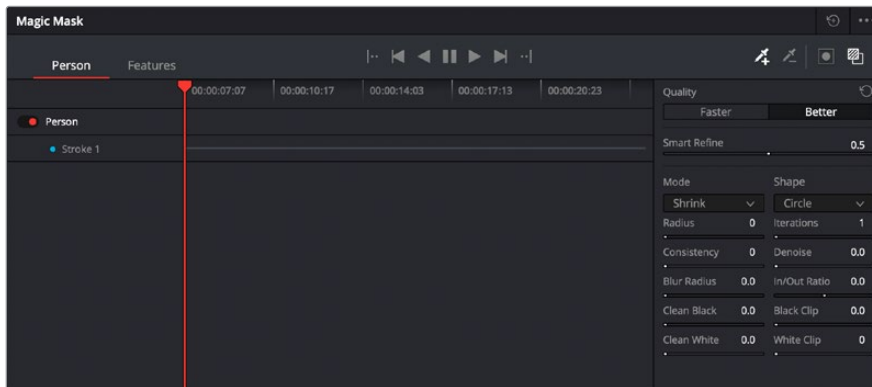
The controls of the Magic Mask palette, in Features mode

Magic Mask Toolbar

A toolbar at the top contains most of the interactive controls of the Magic Mask palette.

- **Target Selection:** A tab control at the left lets you choose the type of mask you want created. There are two choices:
  - **Person:** For creating a mask to isolate as much of a person is visible, given the framing of the shot.
  - **Features:** For creating a mask isolating just someone's face, or hair, or arms, for example. In Features mode, you can also combine multiple specific features into a single mask.

- **Tracking Controls:** The following controls let you track all available strokes to follow camera or subject motion in the frame. From left to right, these include:
  - **Jump to Start of Track:** Moves the playhead to the first tracked frame of a range of tracked frames, in preparation for tracking backwards if there are untracked frames at the beginning of the clip.
  - **Track One Frame Backwards:** Tracks one frame backwards and stops. Useful if you're tracking frame by frame to watch the progress of a particularly complicated bit of motion. If something goes wrong, you can back up to the last frame where the stroke was able to properly track the subject, and drag the stroke to a better location using the pointer to make it follow the subject properly. If necessary, you can go a frame at a time, dragging the stroke to a better position every time it fails to follow the feature you're using it to isolate.
  - **Track All Frames Backwards:** Continuously tracks from the current frame all the way to the beginning of the clip.

- **Stop Tracking:** Stops tracking, in cases where there's a problem with the track and you want to make a change.
- **Track All Frames Forwards:** Continuously tracks from the current frame all the way to the end of the clip.
- **Track One Frame Forwards:** Tracks one frame forward and stops. Useful if you're tracking frame by frame to watch the progress of a particularly complicated bit of motion. If necessary, you can go a frame at a time, dragging the stroke to a better position every time it fails to follow the feature you're using it to isolate.
- **Jump to End of Track:** Moves the playhead to the last tracked frame of a range of tracked frames in preparation for tracking forwards if there are untracked frames at the end of the clip.

- **Stroke tools:** Two tools at the right lets you choose whether to draw strokes to identify the feature you want to isolate, or identify things that aren't the feature in order to eliminate unwanted excursions in the resulting mask.
- **Invert Mask:** A button lets you invert the resulting mask in cases where you want to use the feature analysis of this palette to isolate everything except the feature or features being analyzed.
- **Mask Overlay:** Turns on an onion-skinned overlay with which to see what parts of the image are being masked alongside which aren't, so you can continue to refine the result by adding, moving, or deleting strokes. The isolated part of the mask is tinted translucent red.

Stroke List

Once you start drawing strokes to identify features for mask generation, they appear in this Stroke list.

- **Stroke list header:** The header, at the left of the Stroke list, has controls for selecting, enabling/disabling, and naming each stroke (if you need that level of organization). Right-clicking any stroke in its header reveals controls to Reset Tracking Data and change the mask type (feature or not feature).
  - In Person mode, this is just a flat list of strokes, each of which help to either define the person you want to isolate, or the background.
  - In Features mode, an additional drop-down menu lets you choose which specific feature you want to identify with a guidance stroke. All strokes are sorted hierarchically by the feature they correspond to, so for example each Face stroke appears underneath a Face title bar. The title bar for each feature has a toggle control that lets you turn that feature off and on. When off, you disable that feature's contribution to the overall mask being generated.

- **Stroke timeline area:** A timeline ruler shows the duration of the current clip you're creating a mask for. Each stroke in this list has a track that displays how many frames of each stroke have been tracked. As you track each stroke, these tracks fill up with colored bars to show which frames have tracking data.

  Tracks of strokes that identify a person or features are blue, while tracks for strokes identifying things that aren't the feature are red. Using this timeline, you can keep track of which strokes need to be tracked, and manipulate the tracking data as necessary to obtain a useful result.

Mask Adjustment Controls and Matte Finesse

There are two sets of controls for refining the mask that's output by the Magic Mask palette. The first set of controls, at top, let you adjust how the mask is generated based on the analysis data, which lets you refine the mask result based on characteristics of the image. These include:

- **Quality:** Two options let you choose a tradeoff between quality and performance. Faster lets you generate a lower quality mask more quickly, that's suitable for garbage matting. Better generates a higher quality mask with more detail, that's more processor-intensive.

- **Smart Refine:** This control lets you expand or contract the resulting mask based on the analysis of the image, such that expanding the mask doesn't expand it deeply into surrounding parts of the image that aren't connected to that person. This operation does not introduce softness. Instead, it enlarges or shrinks the overall mask generated by this palette. 0.5 is unity, 0 is the maximum amount of expansion, while 1 is the maximum amount of contraction.

  A second set of mask manipulation controls are for manipulating the mask after it's been generated. Most of these are the same Matte Finesse controls that are available in the Qualifier palette, which are useful for trying to fix issues with problem masks, or soften the edges when you need to have a more feathered result. For more information about the Matte Finesse controls, see Chapter 119, "Secondary Qualifiers," in the DaVinci Resolve User Manual. There is one additional control, however, that's unique to the Magic Mask palette.

- **Consistency:** After you've tracked each stroke to follow the subject over the duration of the clip, this setting lets you choose how much temporal smoothing is necessary to ameliorate jitter in the edges of the resulting mask in areas of low confidence, such as frizzy hair or translucent clothing. Higher settings apply more smoothing to the edges of the mask, but are more processor intensive and may affect how closely the mask follows motion in the image. Lower settings will be faster and more accurate, but may allow more edge jitter in the resulting mask, which can be distracting in the final adjustment you're making. This parameter defaults to 0, so your first application of Magic Mask will always begin with the most accurate (and potentially most active) application of this feature's analysis.

> **IMPORTANT**
>
> Consistency requires a stroke to have a duration of at least a few frames in order to function correctly. This requires you to track each stroke to follow the motion of the camera and subject in order to extend the duration of each stroke. Because Consistency is trying to eliminate one or two frame "noise" in the shape of the mask, strokes of short duration may end up having their effect eliminated.

Choosing What to Isolate

This section elaborates on the different choices that are available for isolation, and offers tips for what each choice is good for.

Person Mode

When you choose Person, every stroke you draw over someone helps to isolate that person's entire body, or however much of that person is visible onscreen. This includes all clothes that person is wearing, including their shirt, pants, shorts, dress or skirt, bathing suit, knickers,

jumpsuits, hat, shoes, even armor or space suit (yes, we've tested both), whatever. Most clothing should be correctly identified as part of the isolation mask you're creating. However, excessively flowing garments may need an extra stroke or two to identify them in complex visual compositions.

Drawing negative strokes, when in Person mode, will identify everything that's not the person you're isolating; this omits both the background and/or other people from the mask being generated. Drawing negative strokes isn't mandatory; you only need to draw a negative stroke if you see a problem such as part of the background being included in the isolation mask.

Features Mode

When you choose features, a drop-down menu appears at the top of the Stroke list. You must first choose the feature you want to isolate from this menu, and then draw strokes over the selected feature (face, hair, etc.) you want to isolate. Each feature's collection of strokes can be turned on or off to add that feature to the overall mask being created.

- **Face:** Isolates just the face and ears, including eyes and glasses. This omits hair and the neck (which is considered part of the Torso). Facial hair, particularly bigger beards, will usually be omitted from an initial stroke made on exposed skin of the face, so you can work on just the skin if you want. However, an additional stroke on the beard will include it in the face isolation.

- **Hair:** Isolates just the hair, stopping at the bangs and ears, and omitting as much of the face as possible. Curly, frizzy, or wispy hair will produce oversized masks encompassing as much of the hair detail as possible. This tool does not create fine transparency. Fine and irregular hair detail can cause jittery edges, but this can be ameliorated using the Consistency control.

- **Torso (Exposed Skin):** Isolates exposed skin above the waist and below the face, excluding the arms. This is the selection you want to enable if you want to isolate the neck, neckline, and any part of the chest that's exposed when wearing v-necks, plunge necks, tank tops, crop tops, or bikini tops.

- **Clothing (Top):** Any clothing above the waist. Exposed skin is omitted.

- **Clothing (Bottom):** Any clothing below the waist. Exposed skin is omitted.

- **Arms (Exposed Skin):** The exposed parts of arms or hands. Shirt and dress sleeves are omitted, as are sun sleeves.

- **Shoes:** Most styles of shoes will be isolated.

- **Legs (Exposed Skin):** Isolates exposed skin below the torso, excluding socks and leggings.

- **Hat:** Most styles of hats will be isolated, although thin accessories such as streaming ribbons or feathers might not be included.

Remember, no matter what feature you've selected to isolate, you can always draw negative strokes to omit other parts of the person or their clothing that are erroneously being included in the mask.

IMPORTANT

When you're drawing strokes in Features mode, accidentally drawing a stroke over a feature other than the one that's selected in the drop-down menu at the top of the Stroke list will result in a completely incorrect mask. If you see this happen, delete the stroke you just made, double-check which feature is currently selected, and either redo the stroke or choose the correct feature you want to isolate.

Identifying More Than One Person

In both Person and Feature mode, you can add strokes to identify more than one person, or more than one person's features. There's nothing special you need to do, simply draw strokes over each person you want to isolate, or over the same feature of each person you want to include (for example, drawing stroke over three people's faces in Face mode).

You can draw strokes over multiple people to isolate them together in the same mask

Using Matte Finesse Controls

There are plenty of situations where a seemingly problematic mask can be improved using the Smart Refine and Matte Finesse controls at the right of the Magic Mask palette. If the mask is only a few pixels off, and the color adjustment you want to make is reasonably subtle, you can probably use Blur Radius and In/Out Ratio to create a soft edge that falls off just at the outer edge of the subject (so as not to create a halo effect) with which to make your adjustment.

(Left) The hard edges of the initial mask aren't quite close enough to the edges of the woman's arm to make a a subtle adjustment, (Right) Using the Blur Radius and In/Out Ratio controls to create soft edges that don't extend past the subject to make a useful mask

Using Magic Mask as a Garbage Matte

In situations where the outer edge of a person is not being detected closely enough for Magic Mask to give a useful result for a more extreme color adjustment, you're probably better off expanding the result into a closely-fitting garbage matte to use for isolating the person or features using other techniques, such as a keyer in the Qualifier palette. Even for this purpose, you'll find using Magic Mask is typically faster than rotoscoping a relatively close garbage matte over a moving figure using windows.

(Left) The initial mask isn't quite close enough to the edges to make an extreme adjustment, (Right) Using the Mode/Shape/Radius/Iterations/Blur Radius controls to expand the matte to be a garbage matte for use with other keys

Dealing With Hair

Wispy or frizzy hair, individual strands of hair being thrown back, and tips of dreadlocks or heavily moussed hair that comes to points will often require special handling with this tool. Keep in mind that the Magic Mask tool does not specialize in soft translucent mask edges like a keyer does. When it comes to hair styles that are loose and free, in many situations you may be able to finesse an acceptable result using the Matte Finesse controls to expand a softened version of the matte to encompass the entire hairstyle.

If this interferes too much with the edges of other features of the subject you're isolating, you can create a dedicated hair mask in Features mode by drawing Hair strokes. You can then use the Matte Finesse controls at the right of the palette to create softened edges that work well with the outer boundary of the hair style you're isolating.

Creating a soft edged hair mask

At this point, you can try doing different color adjustments using two different correction nodes, one for the subject's hair, and another using Magic Mask to isolate everything but the hair.

Alternately, if you want a single matte with which to isolate the entire subject, you can then use additional instances of the Magic Matte tool (one per node), using one node to isolate just the face and body without the hair, and a third node to isolate the entire subject but with a very soft edge. Then, you can use a Key Mixer node to combine all these masks together with the original hair mask you created, with which to feed a complete key to another node used to make the correction.
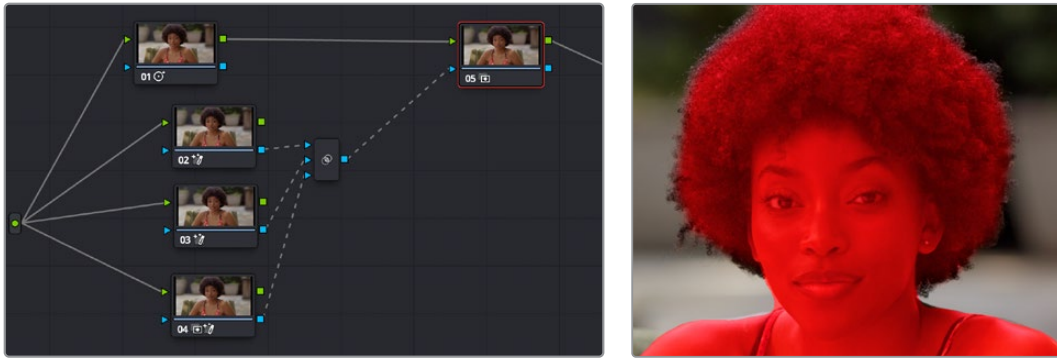
(Left) Nodes 2, 3, and 4 are creating three different masks that are combined using a key mixer and connected to the KEY input of node 5 to make an adjustment, (Right) The final result of this three-mask approach

While hair with soft edges can be a challenge, Magic Mask excels at many elaborate hair styles with detailed shapes and hair accessories, including jewelry and ribbons. For example, the stylized hairstyles found in European and Chinese period movies and shows give the DaVinci Neural Engine no trouble at all, particularly as these styles are usually tightly bound with no wispy hair.

Asymmetrical hairstyles may require extra strokes to identify hair that's significantly longer on one side of the face. This may also be true for unorthodox hair styles, such as hair that's been sculpted into distinct sculptural shapes. Lastly, tight braids that expose skin on the scalp are also challenging for the kind of hard masks that Magic Mask produces, so you're better off using Magic Mask as a garbage matte and using a keyer to create a detailed soft mask to use in these instances.

About Hats

Magic Mask works with an incredibly wide variety of hats from all time periods. On hats, tassels or details like feathers can be a problem (in testing, the feather on Errol Flynn's cap in Robin Hood couldn't consistently be included, even though the cap itself was no problem). Additionally, veils that are part of hats may or may not be easily identified, but an additional stroke usually solves the problem.

Dealing With Accessories

Things that people are holding, such as handkerchiefs or umbrellas, can pose problems. Sometimes, something that's obvious like the blade of a sword will be omitted, while the hilt that's being held in a hand is included with the figure. In these instances, you can choose whether you want to draw another stroke to include the item in the mask, or try to draw a negative stroke to omit it. Your results will vary with the size of the item.

Jewelry and watches pose a special problem, as they're typically so thin and small that they can be difficult to omit, but you may not want to include them depending on the adjustment you're trying to make. Your results will vary with the thickness of the items and the framing of your subject, but in general your results will probably be better if you simply add a stroke or two to include these items in the isolation, since omitting fine detail like a necklace can be problematic.

Adding Strokes to Guide Mask Creation

Here are some tips for how to draw strokes to analyze the image. To identify people, try starting with a single short positive stroke (blue), centered on the face or body.

Drawing the first stroke to identify an entire person

Depending on the result, more strokes may be needed to differentiate an arm or frizzy hair from the background. If you're adding a stroke to an arm or hair, don't put it right at the edge; the goal is not to trace the subject, but to use strokes within the body of the subject to clarify what features belong to the subject, and which do not.
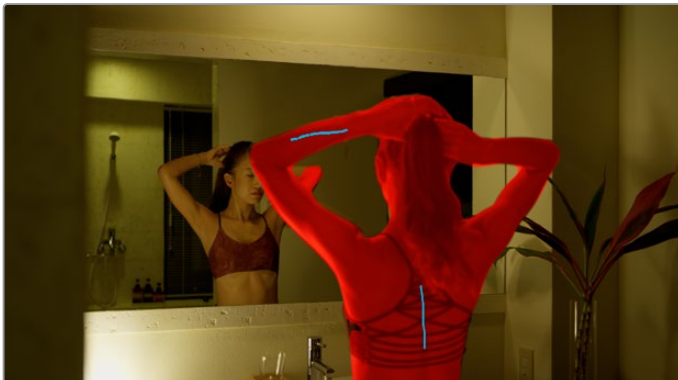
Adding a stroke to the arm to include it as well

As you do this, resist the urge to use too many strokes. One stroke might well be all you need, or you might need two or three, but using more than five strokes for any subject or feature may cause more problems than it solves.
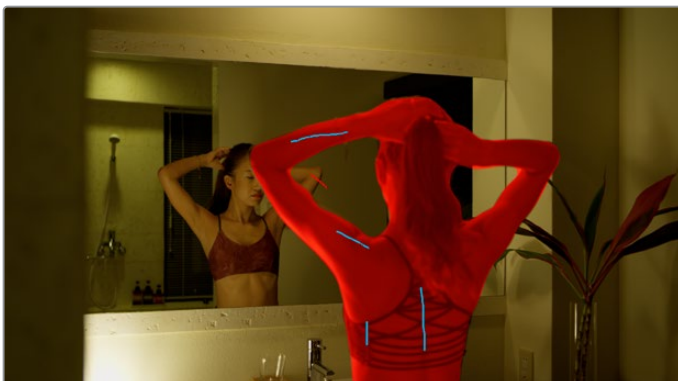
Adding negative strokes to the reflection to remove

To identify faces, try starting with a single short stroke in the middle of the face, along the nose, or from eyes to the lips. Depending on the result, you may need additional strokes to identify the chin, a beard, or to distinguish the forehead from wispy hair.

Drawing strokes to identify a face; notice that additional strokes are needed to include the beard

It's a good idea to start with a single stroke, then track the stroke through the duration of the clip (described later in this section). Over the entire clip, you'll see which parts of the mask may exhibit problems. This will guide where you put additional strokes, in order to more clearly identify the person versus the background, in order to clean up the resulting mask. As you add additional strokes, track those as well and see how things go.

If you notice parts of the background that are erroneously added to the mask, you can add a negative stroke (red) to clarify that those parts of the image should not be isolated. Short strokes, longer strokes, and zig zags are good for backgrounds. Since strokes just help the analysis update the mask, you can try different types of strokes to see what works best, and delete any stroke that doesn't give good results. As with positive strokes, don't use more strokes than are absolutely necessary to get the result you want.
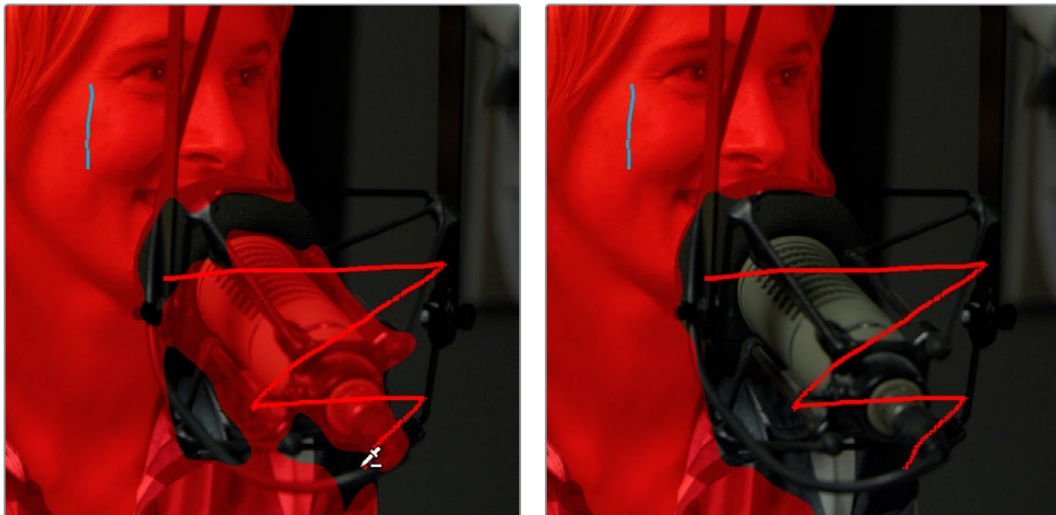
(Left) The microphone incorrectly identified as part of the woman being interviewed, (Right) Drawing negative strokes to identify the microphone as background, using a zig-zag pattern to tag the entire microphone

Similarly, if you're isolating features such as a face, and you find other features, such as hair, getting in the way, you can draw a negative stroke on the hair to identify it as not part of the face.

If there's a "hole" in the resulting mask that's actually part of the background and not the subject, you can try drawing a stroke connecting that hole to the rest of the background.
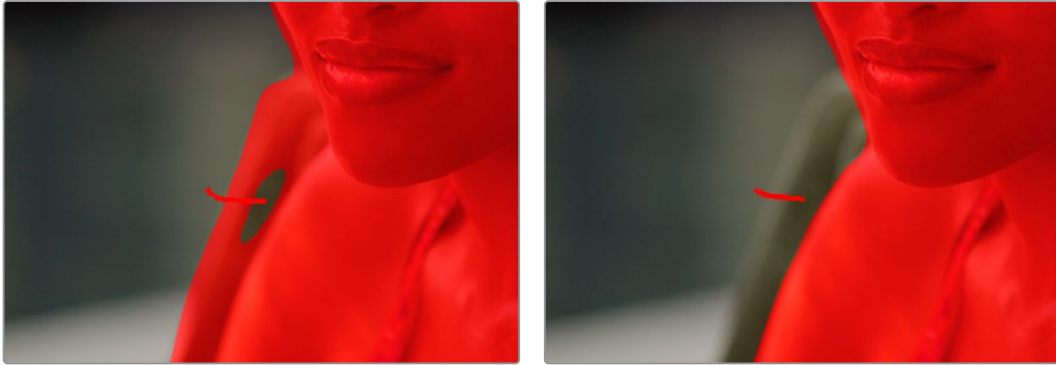
Drawing strokes to connect the background with itself, to remove part of the mask that's not part of the person

If there's an "island" in the mask that's actually part of the subject and not the background, you can try drawing a stroke across the island that connects one solid part of the mask to itself.
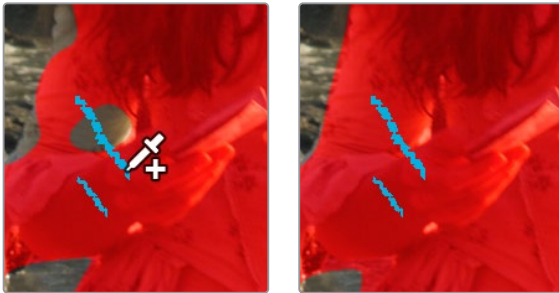
Drawing strokes to fill an island in the subject being isolated

Of course, extracting a mask using strokes is only the first part of creating a useful mask. The Quality, Consistency, and Smart Refine controls let you refine the stroke analysis of the image to create the best tradeoff between performance and quality for the type of mask you need. These controls work hand in hand with the strokes you draw to extract a mask. A set of Mask Finesse controls then let you adjust the resulting mask to manipulate and soften it, to better suit whatever adjustment you're trying to make. All of these controls are described earlier in this section.

Managing Strokes in the Stroke List

When you draw a stroke, it appears in the Stroke list. By default, all strokes last for the duration of the clip to which they're applied, so if you draw a stroke to identify a figure that's not moving, there's no requirement to motion track or keyframe the stroke. Strokes in Person mode appear in one long list, while strokes in Features mode appear hierarchically, with the strokes for each feature separated by the title of each feature. Once a stroke appears in this list, it has the following controls.

- **Enable/disable feature:** In Features mode, once you draw at least one stroke to identify that feature, the title of that feature appears, underneath which is organized all the strokes for that feature. A toggle next to the feature name lets you turn that feature's contribution to the overall mask on and off.

- **Enable/disable stroke:** Each individual stroke in this list has a blue dot that lets you turn that stroke's contribution to the overall mask on or off.

- **Stroke Timeline Area with Stroke Tracks:** The stroke track for each stroke lets you keep track of and manipulate the animation of strokes to follow camera and subject motion. Blue or red frames in this track let you see at a glance how much of each stroke has been motion tracked; blue frames for positive strokes, red frames for negative strokes. You can also use these tracks to identify frames where you'd like to mute that stroke's contribution to the final mask, and to keep track of which frames have been muted. You can draw a bounding box within the stroke track around however many frames of however many strokes for which you want to delete motion tracking, delete keyframes, or mute stroke contributions to the mask.

Stroke Duration

When you first draw a stroke, that stroke has a duration of one frame, located at the timecode position of the playhead when you drew it. If you move the playhead to the left or right, you'll see the stroke disappear. If you want one or more strokes to continue analyzing the subject for the duration of that shot, you need to use the Motion Tracking controls to track the stroke to follow along with the motion of whatever it's drawn on top of. As a stroke is tracked, its duration increases to cover the entire range of tracked frames. If at any point a stroke outlasts its usefulness, such as when a person walks off frame, you can stop tracking that stroke when it's no longer necessary and it will stop contributing to the analysis.

This is useful, because often you'll want to place strokes to deal with analysis issues that only last for a few frames, to fix a hole in the mask that only appears briefly. Just be aware, you can't simply draw a stroke and move on to the next shot; you must track at least one stroke to last for the duration of a subject's time on screen for that subject to be continuously masked.

Tracking and Keyframing Strokes to Follow Subject Motion

You can think of each stroke you've drawn as a persistent eyedropper that samples the image that overlaps it. The mask that results from all strokes' collective analysis of the image is generated live over each frame of the clip. This means that if the camera or the subject moves, you need to motion track or otherwise adjust the position of each stroke to follow along with the motion so the subject continues to be correctly identified. You also need to make sure that each stroke is able to analyze what it's supposed to, and turn off strokes that can't for whatever reason.

> **TIP:** Magic Mask is a processor-intensive operation, so to accommodate users of less powerful workstations, there is a Use Fast Tracking option available in the Magic Mask palette's Option menu, which speeds up the process of tracking at the expense of potentially less accurate tracking for fast or erratically moving subjects.

Methods of Moving Strokes to Follow Subject Motion

For these reasons and more, there are multiple methods of manipulating strokes to refine the final analysis.

- **Motion Tracking:** A set of tracking controls at the top of the Magic Mask palette let you motion track one or more strokes to follow the camera and subject motion in a clip. Every frame that's motion tracked effectively has a motion tracked keyframe placed on it that moves the stroke to a new position.

- **Manual Keyframing:** Any time you drag a stroke from its original position in the timeline, you create a static keyframe at that frame that instantly moves the stroke from its previous position to the new position at that frame. Because these are static keyframes, there's no motion interpolation from one keyframe to the next in order to create animation. Instead, keyframing in the Magic Mask palette is a simple frame-by-frame operation. Every time you move a stroke at a new frame, you change the stroke's position at that frame, without changing stroke position on any other frame that's been previously tracked.

  If this seems simplistic, keep in mind that the goal is not to create beautiful stroke animation with this tool. You only need to move each stroke to follow along with whichever subject or background feature it's supposed to be sampling in each frame. The only important thing is that, in every frame, the stroke overlaps a suitable part of the feature you're isolating to create the appropriate mask. If the stroke itself jumps around abruptly, that doesn't matter so long as the mask that's generated is good. This means that even if you're stuck doing a limited amount of frame-by-frame animation to make a stroke follow along with a troublesome feature (such as a veil flapping in the wind), it'll go pretty fast, because in each frame you're just dragging the stroke to overlap the feature wherever it happens to have moved. This repositioning doesn't have to be smooth, just accurate.

- **Combining Tracking and Manual Keyframing:** Since each frame that's motion tracked is effectively keyframed, manually dragging a stroke on a frame that's already been tracked overrides the tracking data at that frame with a static keyframe that records the new position of the stroke at that frame. If there's no more tracking data either before or after that keyframe, then the stroke disappears until you do more tracking. If there's tracking data immediately after a keyframe, then the stroke jumps to the position dictated by that tracking data.

- **Deleting Stroke Tracking at Specific Frames:** To accommodate cases where a subject you're isolating moves behind something and becomes hidden for a range of frames, you have the ability to delete stroke tracking for one or more frames. This lets you eliminate the stroke for however many frames the subject you're tracking is obscured and cannot be sampled. This makes it easy to deal with features that come and go over the duration of a clip, since you can delete stroke tracking over however many ranges of frames the feature disappears. If you've muted frames by mistake, you can either undo, or re-track the stroke over those frames.

  To delete tracking frames, draw a bounding box on the stroke tracks over the range you want to delete, and then choose Clear Selected Track Data from the Magic Mask option menu.

Option Menu Commands for Removing Strokes and Tracking

The option menu of the Magic Mask palette presents a number of commands for clearing either strokes or stroke tracking data.

- **Clear All Strokes:** Deletes every stroke in the Stoke list, along with tracking.
- **Clear All Strokes of Current Frame:** Deletes the tracking data at the current position of the playhead on all strokes in the list.
- **Clear All Strokes from In to Out:** If you use the I and O keys to set In and Out points in the Stroke Timeline, this command deletes all tracking data on all strokes within that range.

- **Clear Selected Stroke from In to Out:** If you select a stroke in the Stroke list, and then use the I and O keys to set In and Out points in the Stroke Timeline, this command deletes the tracking data of selected strokes within that range.
- **Clear Selected Track Data:** If you drag a bounding box around tracking data for one or more strokes, this command deletes all tracking data within the box.

An Example Stroke Tracking Workflow

By combining motion tracking, manual keyframing, and stroke muting, you'll be able to make short work of isolating most moving subjects. The following procedure illustrates how you might use these techniques together to make the strokes you've drawn follow along with the features you're isolating.

To track one or more strokes to follow a subject:

1   If necessary, move the playhead to the frame where you want to begin isolating the subject you want to mask. For example, if you're isolating a person walking into the room through a door, you probably want to begin your work on a frame where the person is already in the room, and work your way backwards and forwards from that frame. If your subject is already fully visible at the first frame of the shot, you can start there.

2   Draw at least one stroke identifying the subject or feature you want to isolate. You cannot track a stroke to follow the features unless there's at least one stroke.

3   Choose whether you want to track all strokes, or only selected strokes. By default, all existing strokes with at least one frame in the Stroke Timeline at the position of the playhead will be tracked. However, you can choose to track only selected strokes in the Stroke list by choosing Track Selected Stroke Only in the Magic Mask palette's Option menu.

4   Click the Track Forwards to End or Track Backwards to Beginning buttons if you want to motion track the strokes over the remaining duration of the clip.

By default, each stroke is tracked to follow whatever image detail immediately surrounds it; you don't have to define a tracking region, this is done automatically. As tracking proceeds, the tracking bar for each stroke will fill up showing you which frames have been tracked, and which have yet to be tracked. Meanwhile, each stroke being tracked will transform to follow along with simple position and rotation changes in the subject. However, things that obscure the subject, as well as more extreme movements, may cause problems.

Strokes that are tracking a feature that moves off screen are automatically excluded from tracking at the frame where the feature is completely off screen, even if that feature returns onscreen in a later frame.

5   (Optional) If a problem occurs during the track, such as the subject being occluded behind something else in the frame (for example, a person's face moves behind a tree as they walk), click the Pause Track button. You can deal with problems in the track in the following ways:

a. **If a stroke has completely moved off of the subject:** For example, you're tracking a stroke to follow a person and they turn around 180 degrees, so the stroke moves off onto the background. To fix this, pause the track, move the playhead to the first frame where the stroke hasn't followed the subject properly, then use the pointer to drag the stroke onto another part of the subject that's clearly visible. On each frame where you drag the stroke to a new position, it will be automatically keyframed. Continue this process until the subject's motion is consistent enough to be trackable again, and you can then resume tracking.

b. **If a stroke has moved onto something that's partially obscuring the subject:** Pause the track, drag a bounding box over the frames where the track is having a problem, and choose Delete Selected Tracking from the Magic Mask option menu to clear the bad tracking data. Then, move the playhead to the first frame of the deleted tracking data, and use the pointer to drag the stroke onto any part of the subject that's visible to either side of the occlusion. Move the playhead to each successive frame, and drag the stroke onto whichever part of the subject is visible from behind the occlusion, until the subject moves past the occlusion. At that point, you can use the Track Forwards to End or Track Backwards to Beginning buttons to continue tracking as usual.

c. **If the subject becomes completely hidden:** Clips where the subject appears and disappears over the duration of a clip can be resolved by deleting the stroke or strokes on that subject over all frames where the subject is obscured, so that strokes only sample the image when the subject is visible and thus able to be isolated. You can delete one or more strokes by dragging a bounding box over a range of frames, and then choosing Clear Selected Track Data from the Magic Mask option menu.

d. **If a stroke is having trouble following the subject:** If the subject you're tracking is moving too fast, too irregularly, or is changing shape too greatly for the tracker to give a good result (for example, someone lifts their arm towards the camera), you can track through the problem area of the clip one frame by frame using the Track Forward 1 Frame or Track Backward 1 Frame buttons, and then use the pointer to manually drag the stroke to follow along with the subject as you go. Once the problem motion stops and the motion of the subject becomes more regular, you can use the Track Forwards to End or Track Backwards to Beginning buttons to continue tracking as usual.

e. **If the subject is moving off the frame:** If you've drawn a stroke in the middle of someone's face, and their face is moving off screen, you can manually reposition the stroke on the last few frames before the subject completely exits so that stroke continues to identify what parts of the face are still visible even though the part of the face it was originally following becomes hidden. Once the face completely exits the frame, you can mute the stroke for the rest of the shot.

6 (Optional) If you only tracked the stroke's movement over part of a shot, you can click the Jump to Start or Jump to End buttons to move the playhead to the first or last tracked frame, in preparation for tracking from that frame onward.

Sat vs. Lum Curve

The inverse of the Lum vs. Sat curve, Sat vs. Lum lets you quickly adjust the luminance of pixels that falls within a particular range of saturation. This is useful for cases where regions of the image you want to make lighter or darker happen to coincide with an identifiably consistent range of saturation.

To help guide your adjustment, the histogram drawn for this curve lets you see how many pixels there are at each level of saturation found within the image, with the leftmost part of the curve representing minimum saturation, and the rightmost part of the curve representing maximum saturation. Seeing where the levels of saturation lie in the current image help you to quickly make targeted luminance adjustments when you sample the region of the image you want to adjust to add points to this curve.
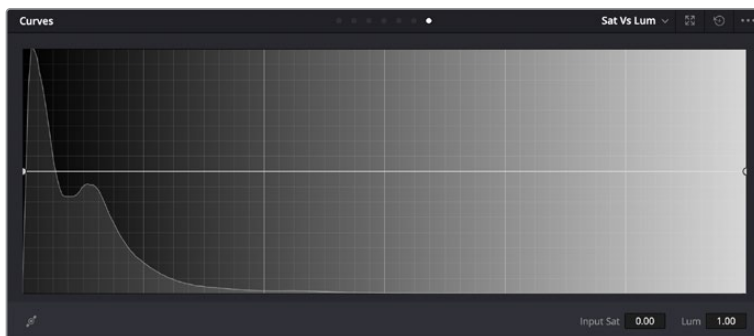
The Sat vs. Lum curve

In the following example, the right side of this curve is lowered so that the most saturated parts of the image become darkened. You might want to make an adjustment like this to emulate one of the properties of film, where highly saturated colors block more light from passing through the emulsion than less saturated colors. Or, you may do this in an effort to desaturate bright colors in highlights that might otherwise clip past maximum white. Or, you might do this to quickly darken highly saturated skies.
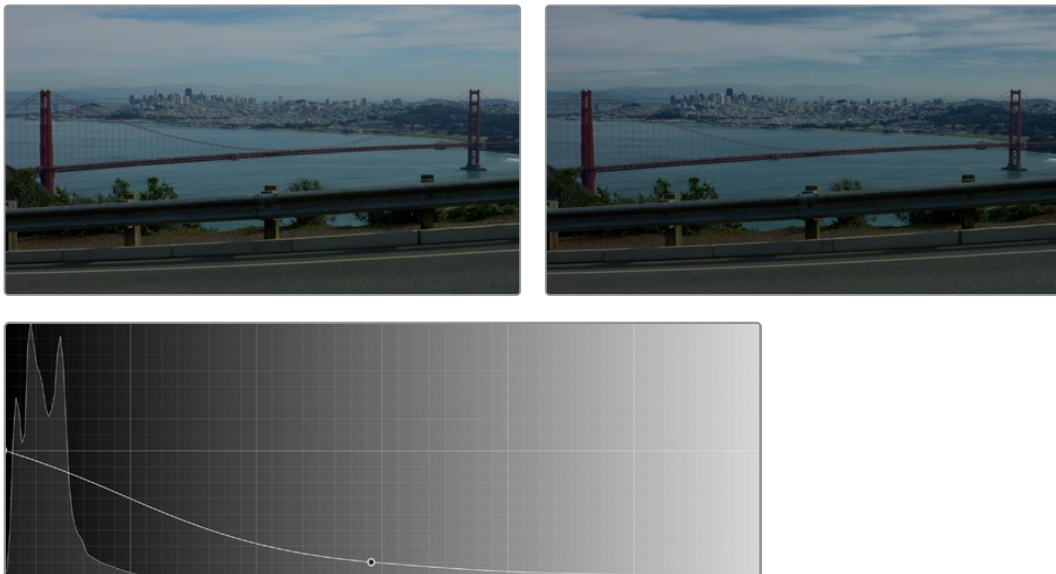
(Top Left) The original image, (Top Right) The highly saturated blue sky and sea reflections are darkened to a more intense blue by lowering the right part of the Sat vs. Lum curve (Bottom)

LUT Improvements

DaVinci 17 includes numerous improvements to the management and use of LUTs.

Support for Custom LUT Paths

A list in the General panel of the DaVinci Resolve System Preferences lets you add multiple file paths for loading LUTs that you want to use in DaVinci Resolve. This works for network volumes for facilities where multiple workstations are accessing a central collection of LUTs to be shared among multiple artists. Clicking the Add button lets you add a file path to this table from a dialog. Selecting a location in this list and clicking Remove removes that location.
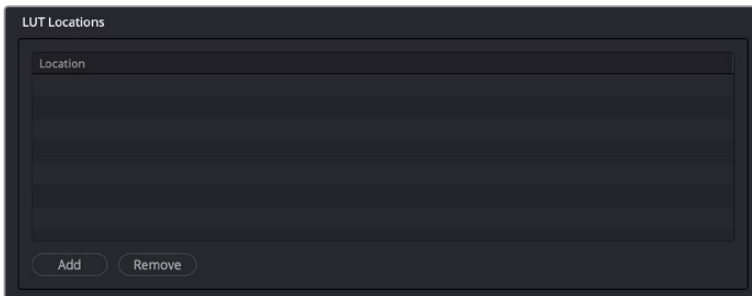
A list in the General panel of the System Preferences lets you add multiple locations where LUTs you want to use from within DaVinci Resolve are located

Support for Generating 17 Point 3D LUTs

The Generate LUT submenu that's available when you right-click a clip thumbnail in the Color page has a new option, Generate LUT > 17 Point Cube. While 17 point LUTs are not recommended to use for grading, they are useful when exporting LUTs for on-set monitoring, to accommodate different display, calibration, and signal conversion devices.

Support for Video Range LUTs

DaVinci Resolve 17 adds support for importing LUTs that include additional metadata specifying them as processing image data in Video Range, rather than Full Range. More information about how to format LUTs as Video Range is included in the Developer Documentation available from the Help menu. Being able to specify whether a LUT is meant to be Video or Full Range allows LUT processing to automatically accommodate DaVinci Resolve's data range setting pipeline for clip attributes, project settings, and output settings.

Improvements to Existing Tools

DaVinci Resolve 17 features updated video scopes with greater performance and more options.

Updated Look and Feel of Primaries Palette

The Primaries palette, including the Lift/Gamma/Gain controls, Color Bars, and Log Wheels, all have an updated look and feel that matches the new controls of the HDR palette.
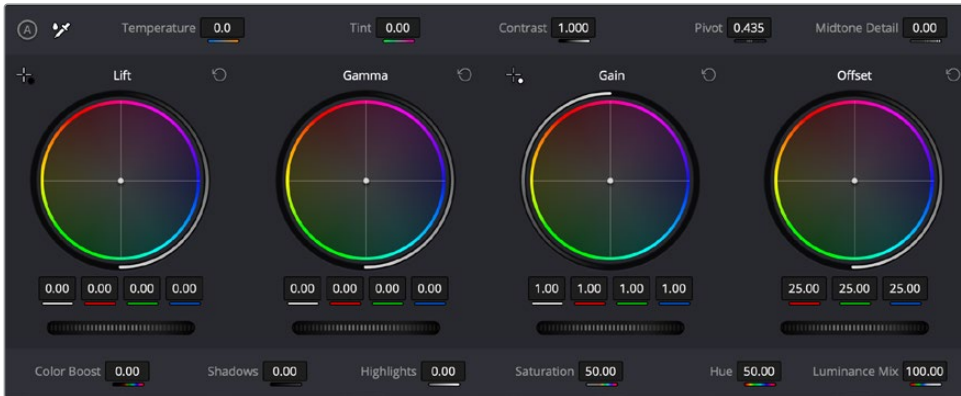
The Updated Color Wheels panel of the Primaries palette

Additionally, the Temperature, Tint, Contrast, Pivot, and Midtone Detail controls have been moved to a bar at the top of the palette, while the Color Boost, Shadows, Highlights, Saturation, Hue, and Luminance Mix controls are located at the bottom, for simultaneous display and control of all of these parameters.
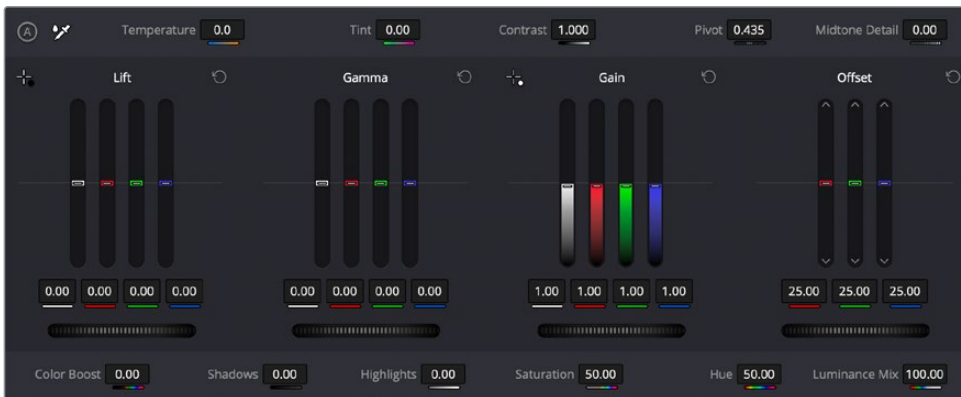
The Updated Color Bars panel of the Primaries palette

Improved Power Curve Window Drawing

Power Curve window drawing has been refined to be smoother and more responsive. While drawing a curve, an unfinished curve segment no longer automatically connects to the current pointer position. Also while drawing, you can select previously drawn points to move them, to adjust their spline handles, or to delete previously added points, without the need to finish the window first.

Additionally, the Inside and Outside softness splines are visibly thinner than the center spline, making them easier to differentiate.

Split Screen Previews of Multiple Playheads

A new split screen mode lets you set up simultaneous comparisons in the Color page Viewer of up to four playheads displayed in the mini-timeline. This is useful both for comparing multiple clips, as well as for comparing different frames within the same clip.

Placing three playheads in the mini-timeline

When you choose multiple playheads from the Color > Active Playhead submenu, you have the option of selecting the Playheads mode when you enable Split Screen in the Color page Viewer. For every playhead you expose (up to 4), the frame at each playhead will be displayed in a 2-up, 3-up, or 4-up grid. An outline in the Viewer (if enabled) shows which playhead is currently active.

Additional Wipe Modes in the Color Viewer

Three additional Wipe modes have been added to choose from when doing a Gallery or Timeline wipe to compare two frames. These provide substantial additional flexibility for comparing images in different ways.

The Wipe modes available in the Viewer Options bar of the Color page Viewer

The three new modes are:

- **Diagonal:** Lets you compare both halves of the wipe via an adjustable diagonal border. Dragging the pointer repositions the wipe to the left and right. Hold the option key down and drag while moving the pointer around in a circle to rotate the border of the wipe to any angle you like.
- **Venetian Blind:** Lets you compare both images being wiped via alternating horizontal strips. Drag the pointer up or down to change the size of the alternating strips. Good for quickly comparing vertical color uniformity, focusing on color and contrast changes that occur from top to bottom.
- **Checkerboard:** Lets you compare both images being wiped via an alternating checkerboard. Drag the mouse left or right to alternate between images by squeezing each check horizontally. Good for comparing color uniformity across the width and height of two images.

Smart Filter Options for Marker Metadata

When creating Smart Filters with which to filter the contents of the Thumbnail Timeline, the MediaPool Properties category now contains settings for choosing Marker Name, Marker Notes, and Marker Keywords as filtering criteria. Using these criteria, you can filter the Thumbnail Timeline based on marker contents.

Support for Fast Review on the Color Page

The Fast Review playback command (Playback > Fast Review) is now available on the Color page. Intended to help you watch through long sequence of clips quickly, clicking this button begins accelerated playback through the Timeline, where the speed of playback is relative to the length of each clip you're playing through. Long clips play faster, whereas shorter clips play closer to real time.

Override Input Color Space of Clips in Preconform Workflows Using Color Management

When you preconform a flattened master media file using an EDL with the File > Import Timeline > Pre-conformed EDL command, and your project has Resolve Color Management or ACES enabled, you can now change the Input Color Space of each clip in the resulting timeline independently. To do so, open the Color page, right-click the clips you want to customize, and choose an option from the Input Color Space submenu of the contextual menu.

This is useful in workflows where you've received a flattened media file that was output with clips in different color spaces, for example mixing Rec.709 media with log-encoded clips of different kinds.

Video Scopes Improvements

DaVinci Resolve 17 features numerous enhancements to the video scopes.

Support for Multiple Instances of the Same Scope

Users can instantiate more than one of each kind of video scope in multi-scope layouts, for instances where users want to view variations on a particular type of scope with different settings. For example, you might want to expose three Vectorscopes, setting each to a different tonal range so you can simultaneously view Vectorscope analyses of Low (shadows), Mid (midtones), and High (highlights).
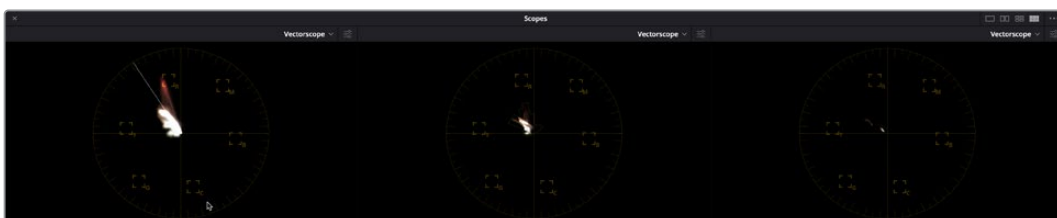
Three Vectorscopes set to analyze the shadows, midtones, and highlights independently

3x3 Layout Available for the Video Scopes Window

To accommodate users who want to use the Scopes window to its fullest capabilities, there's now a 3x3 layout that lets you show 9 different scopes and scope variations simultaneously.

Different layout options in the Scope window

Ability to Open Separate Video Scopes Window in Dual Screen

If you have three computer displays and you choose Workspace > Dual Screen > On to enable dual screen layouts, you can now open the Scopes window (Workspace > Video Scopes > On) and place it on your third display, as large as you need.

Customizable Waveform Scales

A Waveform Scale Style submenu in the Video Scopes option menu (the three dots menu) lets you choose how you want the numeric scale at the left of Waveform and Parade scopes to be represented. There are options for 10-bit display (the default), 12-bit display, Percentage (0 to 100), millivolt (mV), and HDR (ST.2084/HLG). Aside from the added flexibility this gives you, this also means that it's no longer necessary to go to the Preferences to change the scope to have an HDR scale shown in nits (cd/m^2).
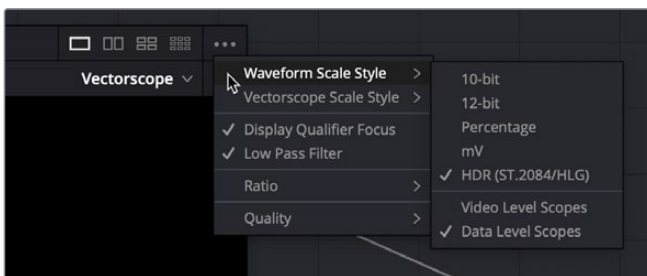
Waveform scale options

Customizable Vectorscope Scales

A Vectorscope Scale Style submenu in the Video Scopes option menu (the three dots menu) lets you choose how you want the hue reference indicators to be displayed.
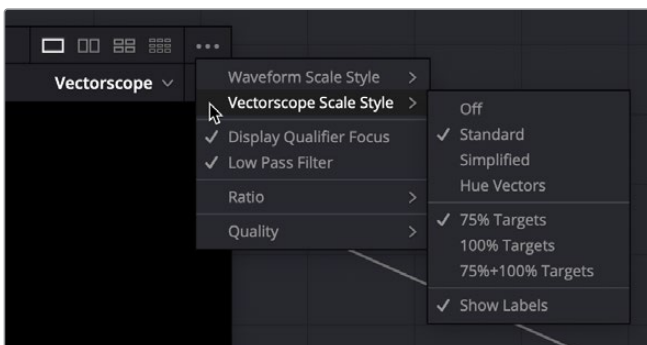
Vectorscope scale options

There are four available graticule options:

- **Off:** Disables all graticule overlays in the Vectorscope, giving you a clean view of the Vectorscope graph against black.
- **Standard:** The default layout. Cross hairs indicate the center of the scope, while boxes indicate the center target of each primary and secondary hue (red, magenta, blue, cyan, green, yellow). An outer circle provides a a general frame of reference for the angle that any part of the graph might fall along.
- **Simplified:** Shows a crosshairs to indicate the center of the scope, and smaller crosshairs to indicate each primary and secondary hue. Useful when you want references without extra complications.
- **Hue Vectors:** A graticule designed to provide a more useful colorist reference for creative decisions and image comparison. This isn't simply decorative. Graticule lines stretch along the reference angle of each primary and secondary hue from the hue targets to the center, providing a more immediately useful frame of reference when comparing different vector scope graphs to one another. These reference lines fade out within the region of average saturation in most images, so they don't get in the way of discerning faint details. The center crosshairs are aligned with the red-cyan and yellow-blue axes, indicating the naturalistic warm to cool axis that lies between them. Tic marks indicate both the 75% and 100% levels of image saturation for each hue.

You also have the option of choosing whether or not the primary and secondary hue targets are shown for 75% image saturation, 100% image saturation, or both, and whether or not you want to show the text labels for each hue.

Updated Order of Operations

The addition of the HDR palette and Color Warper necessitates an updated diagram of the order of all image processing operations in DaVinci Resolve, from input through output. A truly detailed breakdown now requires two charts; the first chart details the overall order of operations taking place on every page, while the second zooms into the specific order of operations occurring within each node of the Pre-Clip, Clip, Post-Clip, and Timeline grades that you create on the Color page.

Overall Image Processing

In the following chart, each image processing operation in DaVinci Resolve is shown in the order in which it's processed. Operations are color-coded to indicate the page on which those controls appear, because in many cases page order does not determine image processing order. Why? Either to make sure each operation is processed as cleanly as possible, or to give the user the maximum control over the image. For both of these reasons, image processing order is carefully considered, and in some cases the best result requires operations on different pages to alternate with one another.

Most of the time, this order of operations is irrelevant to the user who's only interested in the end result. However, if you're trying to achieve something very specific, or if you're wondering why you see a particular result when you use the features of the Cut, Edit, Fusion, and Color pages together all at once, this chart should help make things clear. Finishing artists in particular should find this chart illuminating.

Source Processing

Camera Raw Settings → **Lens Correction** → **RCM Input to Timeline Color Space Conversion or ACES IDT**

Super Scale ← **Deinterlace** ← **Input LUT**

Fusion Page Compositing

Timeline Processing

Edit Sizing → **Input Sizing** → **Fusion Effects** → **Pre Clip Grade (Group Grade Only)** ∗ → **Cut/Edit Page Open FX and Resolve FX**

Timeline Grade ∗ ← **Cut/Edit Page Track Compositing (Alpha/Composite Modes and Opacity)** ← **Speed Effects** ← **Post Clip Grade (Group Grade Only)** ∗ ← **Clip Grade** ∗

Processing After the Timeline

Subtitles → **Output Sizing (PTZR)** → **Output Sizing (Blanking)** → **Output LUT** → **RCM to Output Color Space Conversion or ACES RRT to ODT**

Data Burn-In → **Color Page Display LUT**

Data Burn-In → **Deliver Page Output**

☐ **Cut/Edit Page Feature**   ☐ **Color Page Feature**   ∗ **See operations within Corrector Nodes**

The overall order of image processing operations in DaVinci Resolve, from input through output

Image Processing Within Grades

For Pre-Clip, Clip, Post-Clip, and Timeline grades on the Color page, most Color page operations are available within each Corrector node you add to the Node Editor. Within each node, these operations take place in the following specific order.
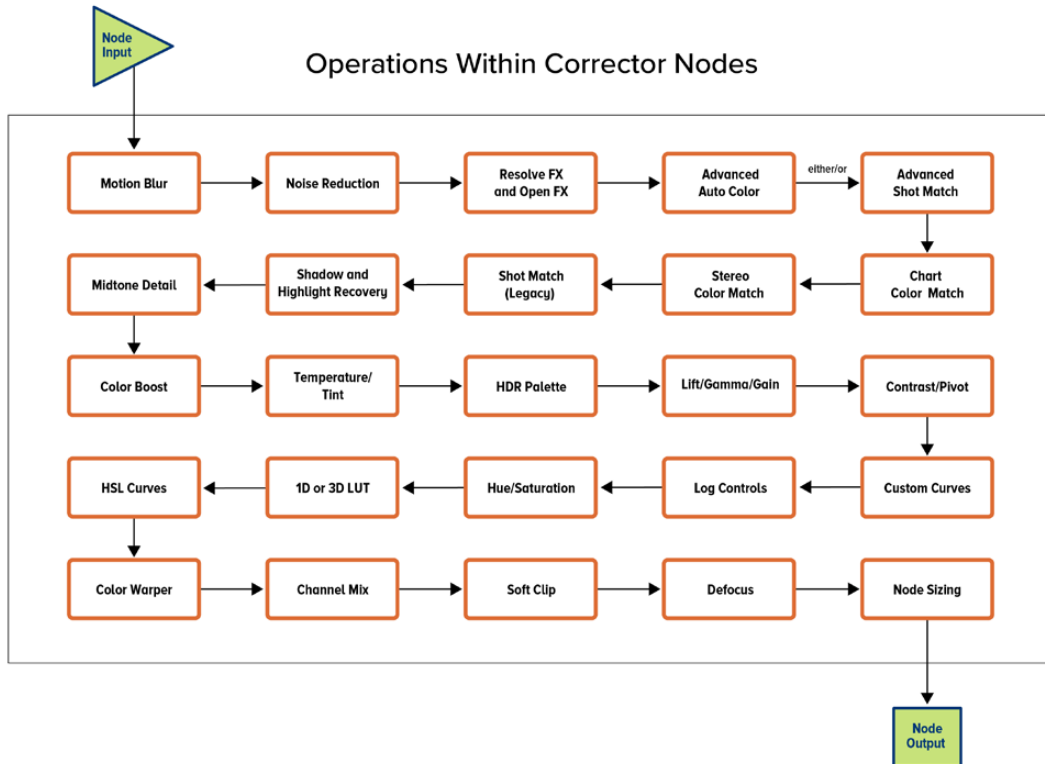
The order of image processing operations that takes place within each Corrector node in the Color page

Thanks to the modular operation of the Node Editor, if a pair of image processing operations you need to use isn't in the ideal order for what you're trying to do, you can apply each operation using two different nodes in order to force those operations into the order you want. Similarly, when using Layer, Parallel, or Key mixer nodes, the order of operations can be seen in the visible arrangement of nodes in your node graph.

That said, most colorists tend to spread different operations across multiple nodes whether they need to or not, for organizational purposes or to "sandbox" certain volatile decisions that might need to be easily revised later. However, nothing's keeping you from using multiple operations within a single node if you prefer a simpler node structure for your grading. Thanks to the flexibility of the Color page, it's your choice.

Chapter 8

Resolve FX Improvements

Every new release of DaVinci Resolve ships with new and improved
Resolve FX, and version 17 is no exception.

Contents

Brand New Resolve FX

DaVinci Resolve 17 adds several new effects that are useful for a wide variety of creative and corrective tasks.

Texture Pop (Resolve FX Texture, Studio Only)

Texture Pop is a more sophisticated and flexible version of the Midtone Detail control found in the Primaries and HDR palette. Using the controls of this effect, you can either remove texture, or exaggerate it. There are two modes of operation that determine how specific a result you can achieve.

- In **Simple** mode, you can apply more extreme versions of the Midtone Detail effect found in the Primaries and HDR palette. A single Details slider lets you soften or sharpen midtone detail in the image with a greater range of operation, while a Strength slider lets you exaggerate the effect further or attenuate the effect to back it off.

- In **Advanced** mode, you can fine-tune the softness or sharpness of high, medium, and low-frequency image detail with great specificity via seven individual "details" sliders, labeled Rough, Coarse, Medium, Small, Fine, and Tiny. This lets you adjust the textural characteristics of multiple frequencies of image detail in different ways, for example softening Fine detail while intensifying Medium detail. The Strength slider lets you exaggerate or attenuate the overall effect caused by all sliders.

In either mode, the Details/Range sliders default to 0.000, which causes no change to the image. This is the level to choose to preserve the original quality of detail in the image. They range from -1.000 (maximum softening) to +1.000 (maximum sharpening). Additionally, a set of Tonal Range controls (described later) lets you choose how much of this effect is applied to the Shadows, Midtones, and Highlights of the image, giving you even more specific control over which parts of the image are softened and/or sharpened.

Understanding Advanced Mode

Advanced mode is the most exciting way to use this effect. The best way to learn what Advanced mode does is to set all of the Details sliders to -1.000, and then raise each one individually to see what kind of image detail get reintroduced, and ultimately enhanced if you raise each slider above 0.000. In the following image, each of the Details sliders has been set to -1, which is the maximum smoothing for each setting. The result is an image with minimal detail.

In the following example, a person and the mechanical details of a helicopter shot are smoothed by setting each detail slider to -1.000. You can see that the resulting images both retain the broad strokes of color and contrast that define each region of color, but outside of high-contrast edges, all textural detail has been smoothed to a clean gradient.
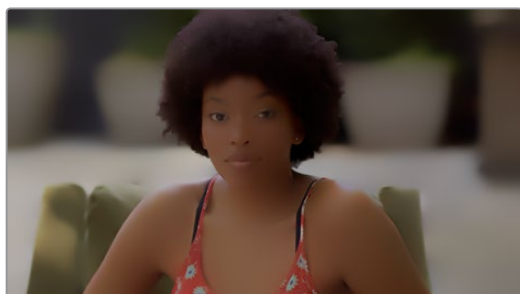
(Left) An image of a person with all detail smoothed,
(Right) An image of mechanical detail with all detail smoothed

Then, by raising each of the Details sliders back to 0 or even +1 one at a time, you can see exactly what kind of detail that slider is affecting. As you can see in the example of the person, the Tiny and Fine sliders are affecting only the smallest details, hairs, lines, and pores of the skin. In the helicopter detail, you can see the kind of small textures, tiny lines and rivet details that come back.

(Left) The same image of the person with the Tiny and Fine sliders raised to add subtle detail back to the image, (Right) The helicopter detail with Tiny and Fine detail added back to the image

Here are two sets of generalizations that hold true if you're thinking about the detail of a human face.

- Tiny, Fine, and Small controls affect the smallest details in an image, including the pores (tiny), blemishes (fine), and wrinkles (small) of average closeup shots. Other features affected would include high-frequency edge detail of strands of hair, leaves on a tree, or text on a page of paper or screen.
- Rough, Coarse, and Medium tend to affect progressively smaller shadow contouring of faces, bodies, and objects.

Of course, the granularity of a particular type of image detail depends on how much of a closeup or long shot the clip is. When the camera is closer to the subject being adjusted, you'll be able to adjust much finer details. When the camera is distant, then even large details on the subject are affected by the Tiny, Fine, and Small controls. This means when you create an adjustment for a subject in a closeup, you'll need to make changes to the adjustment if you try and apply it to a long shot.

Mode Controls

- **Operating Mode:** Lets you choose between the Simple and Advanced modes of this plug-in.
- **Color Mode:** Lets you choose between working in RGB and Luma/Chroma mode. In RGB, a single set of parameters affect all three color channels at once. In Luma/Chroma mode, two sets of controls let you fine-tune the luma and the chroma separately.
- **Output Mode:** Lets you choose between outputting the Final Result, Differences mode which lets you see the effect differenced against the original image, and Difference Magnitude, which shows a high-contrast differencing comparison.

Details Controls

- **Strength:** Lets you exaggerate the effect of the other Details sliders further, or attenuate the effect to back it off.
- **Details:** (Simple mode only) Lets you soften or sharpen midtone detail in the image with a greater range of operation.

- **Rough/Coarse/Medium:** (Advanced mode only) These three sliders affect progressively larger contours of the image, appearing to affect the shadows and structure of the image.
- **Small/Fine/Tiny:** (Advanced mode only) These three sliders affect progressively smaller details and texture of the image, adjusting medium to tiny details, lines, and specks.

Tonal Range Controls

- **Shadows:** Lets you reduce the effect you've created in the shadows of the image, as defined by the Low Range parameter.
- **Midtones:** Lets you reduce the effect you've created in the midtones of the image, as defined by the Low and High Range parameters.
- **Highlights:** Lets you reduce the effect you've created in the highlights of the image, as defined by the High Range parameter.
- **Low Range:** Lets you define the image value that defines the transition from Shadows to Midtones.
- **High Range:** Lets you define the image value that defines the transition from Midtones to Highlights.

Detail Recovery (Resolve FX Texture, Studio Only)

Detail Recovery is a utilitarian effect that lets you extract image detail from the second input, in order to re-add it to the image coming in the first input. In this way, you can selectively add detail back to an image in which it's been removed. Because of how it works, this is an effect that's intended to be used on the Color page.

To use Detail Recovery, you must add it to the node tree as a Resolve FX node (dragging it directly from the Open FX library into the node tree as its own node), in order to expose both of the RGB inputs that appear on the node when you do this. By default, the first RGB input is for the image you want to add detail to, and the second RGB input is for the image you're extracting image detail from.

In the following example, Node 1 is the base grade, and Node 2 is a grade in which the highlights are being blown out for stylistic effect. The Detail Recovery node is then being added to add specific image detail from Node 1 back to the output of Node 2.
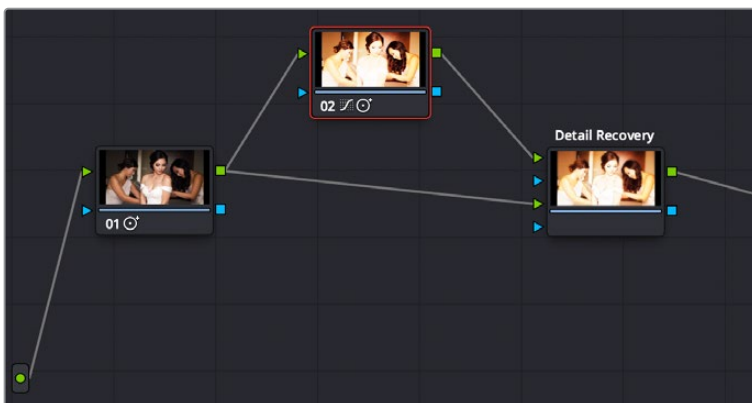
Setting up the Detail Recovery effect to add image
detail from Node 1 to the image coming from Node 2

The result, compared with the image in Node 2, is an image that's still harshly exposed, but that has traces of fine image detail so it doesn't look so clipped.

(Left) The image with highlights compressed harshly, (Right) The image with high-frequency detail added back

Detail Recovery has the following parameters.

Detail Recovery

- **Transfer Direction:** This drop-down menu lets you choose which input provides the detail, and which input the detail is combined with.

Details Extraction

- **Frequency Cutoff:** A slider that lets you choose how much detail you want to extract for recovery. Lower values isolate finer details: higher values include progressively larger details.

- **Strength:** This slider lets you exaggerate or attenuate the detail that's extracted for recovery.

- **Detail Mix:** At a value of 1.000, this slider blends the extracted detail with the image you're adding it to so that both layers blend together. At a value of 0.000, the extracted detail replaces whatever overlapping pixels are in the image you're adding it to. Using this slider, you can choose the best blend for your purposes.

- **Preview Detail checkbox:** Turning this checkbox on lets you see the detail that's being extracted using the Frequency Cutoff and Strength sliders.

Video Collage (Resolve FX Transform)

Video Collage is designed to make it easier to create grid-based layouts of multiple video layers to create different kinds of split-screen effects, where each video layer appears within a "tile" that can be styled in different ways. Layout controls let you choose how many rows and columns there are, which determine how many tiles are available to arrange tiles of video next to one another in different ways, with additional controls for creating offsets, changing the margins around and spacing between the tiles, and rounding the corners of each tile.

This effect is designed to be used in the Cut and Edit page, and there are two ways that you can set this up, which are chosen using the Workflow drop-down menu.

Create Background

The Create Background option is perhaps the simplest way to create a split-screen using this effect. This mode creates a frame with holes in it, behind which you can position multiple layers of video. These clips are placed on tracks underneath the background clip in the Timeline, and use each clip's individual sizing controls in the Inspector (which can be used via on-screen Transform controls in the Viewer) to scale and position them correctly within the holes. The Video Collage effect is applied to the topmost superimposed video or still image clip in the Timeline, in order to use that clip as a background for the frame.

In the following example, the Video Collage effect is applied to the clip on track 5, which has four other clips underneath it in a stack, each of which has been positioned to fit in one of the holes of the frame.
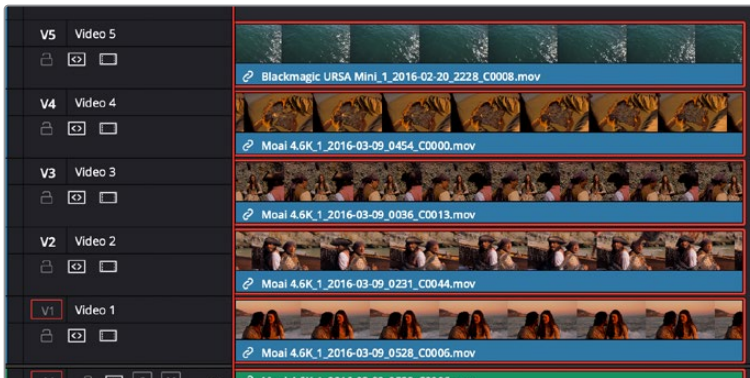
A stack of clips to create a split-screen effect; the top-most clip is used as the background by the Video Collage effect in Create Background mode, while the stack of clips underneath are all positioned to fit into the holes created in the top clip

Create Background mode makes it easy to create a split-screen layout of different clips without having to resize them with precision to align the edges and sizes of each clip. The width of the frame that's created gives some wiggle-room to reposition and animate each individual clip within the hole it shows through. You can see the resulting effect created in the previous example below.
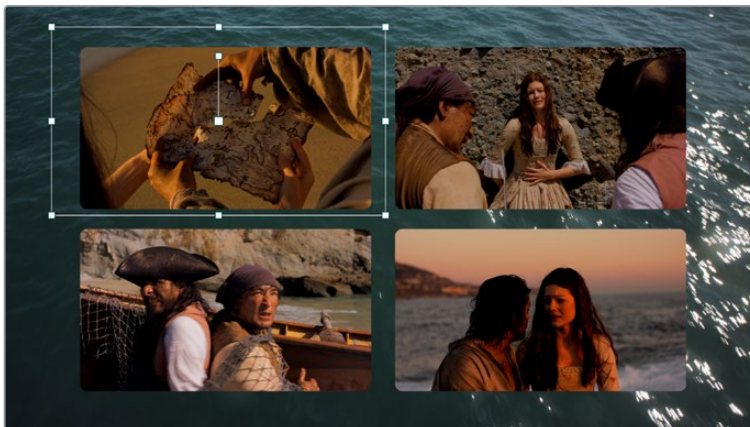
The resulting split-screen effect, with four clips arranged to show through the holes created in the top "background" clip that's creating the frame; you can see the onscreen controls corresponding to the clip on track 4 that have been used to position and resize it to fit

Create Tile

This mode of operation is a bit more work to set up, as it requires you to create a layout in one instance of this effect, but it gives you more options, automatically transforming each layer of video in your stack of clips in the Timeline to fit a layout you design. The best way to work in Create Tile mode is to edit a stack of superimposed clips in the Timeline, but this time if there's a clip you want to use as the background, it should go at the bottom of the stack.
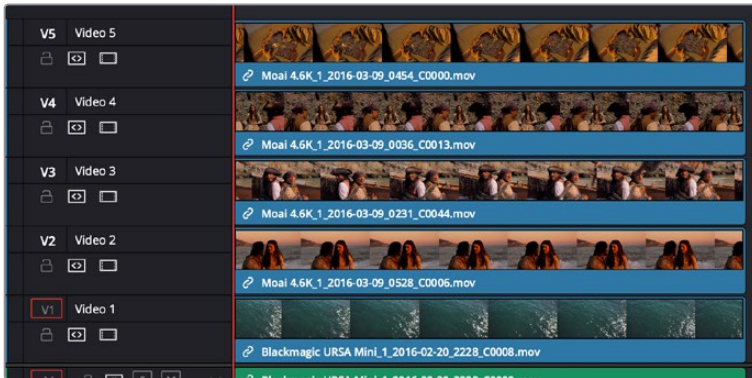
A stack of clips to create a split-screen effect in Tile mode; the bottom clip is going to be used as the background

Then, apply the Video Collage clip to the topmost clip, and set the Workflow drop-down menu to Create Tile. Immediately you'll see that the current layer has been fit inside the first rounded tile of the default layout of four tiles. For clarity, video tracks 4, 3, and 2 have been muted so you can see the current clip turned into a tile against the bottom clip that serves as the background for this arrangement.

The topmost clip set to create the first tile in a layout; video tracks 4, 3, and 2 are disabled to show the top clip against the bottom clip that's being used as the background

Ultimately, you'll use Paste Attributes to apply a copy of this effect to each clip on the Timeline that's supposed to fit inside a tile, and once you choose which clip goes inside each tile, that's what will create the arrangement. Before you do that, however, you need to customize the layout.

To get a preview of the entire layout, for further customization, turn on the Preview Layout checkbox in the Inspector. This draws a preview of how all the tiles will be placed using the current layout. Using this preview, you can make whatever changes you want to set things up, before you copy this plug-in to all the other clips in the stack.
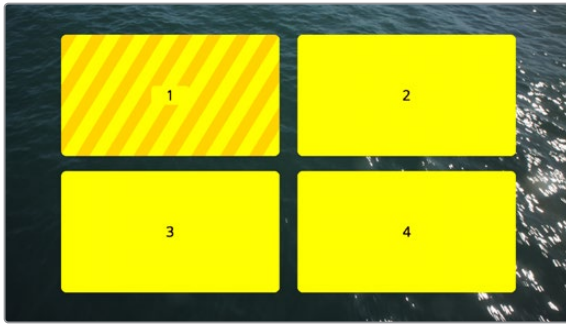
Turning on Preview Layout to customize the layout

With Preview Layout enabled, you can use the Layout controls below to choose how many columns and rows of tiles there are, to stagger the tiles horizontally or vertically, to round or square off each tile by a variable amount, and to alter the margins and spacing. In this way, you can create a wide variety of different symmetrical layouts really easily. In this example, we'll create a layout with one row, three columns, that's staggered vertically.
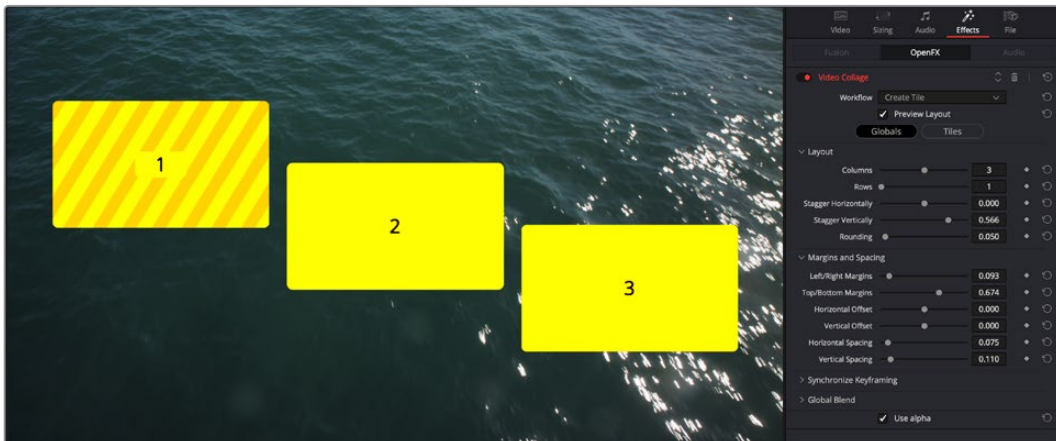
Our new customized layout, shown next to the Inspector controls for this effect

Now that this is done, we'll turn off Preview Layout to focus on the current clip's integration into our layout, and we can see that it doesn't quite fit into the box. Click the Tiles button in the Inspector. This reveals the Tile-specific controls, which include the Resize Content controls. Click the disclosure control to open these up, and use the Pan, Tilt, and Zoom controls to make this image fit into the tile full screen.
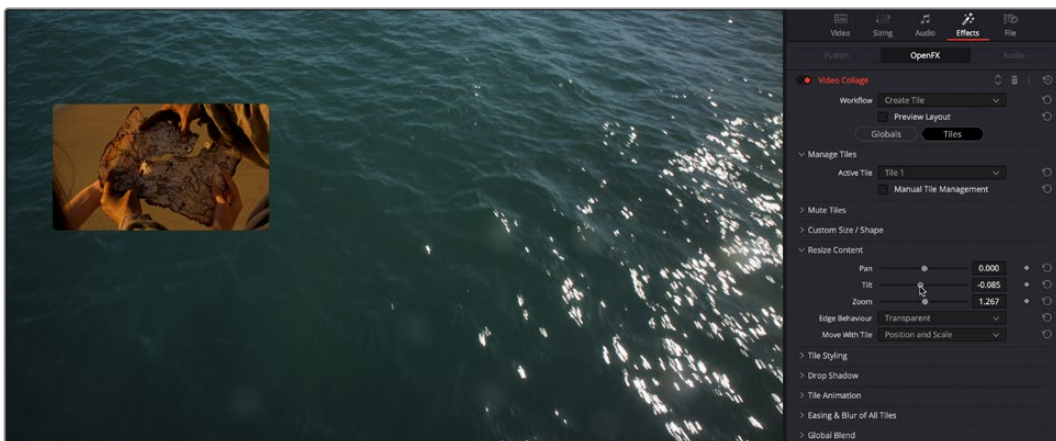
Tiles controls in the Inspector with Preview Layout disabled, so we can focus on customizing the current tile

You should also note the Active Tile drop-down menu. This menu serves two purposes. First, it defines which tile the current clip is displayed within. This becomes important later on when you apply this effect to multiple superimposed clips. However, it also determines which tile you further customize using the Tile-based controls of the Inspector. If needed, tiles can be individually styled.

The Manual Tile Management checkbox is off by default, which enables DaVinci Resolve to automatically update the number of tile entries in the Active Tile drop-down menu with items equal to the number of grid positions (or grid nodes) defined by the rows and columns you've set, without you needing to do anything. For simple symmetrical layouts, this is easiest. However, if you turn Manual Tile Management on, you gain the ability to add and delete tile positions manually, which enables other options. For now, we'll leave this turned off.
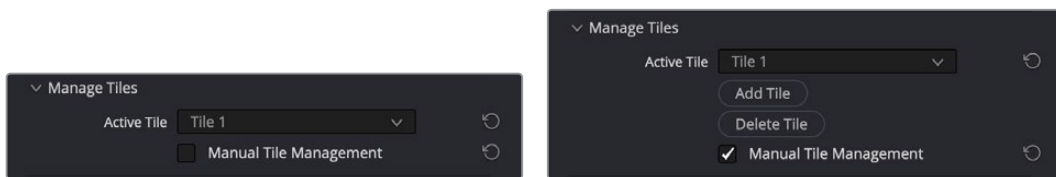
(Left) The Active Tile drop-down with Manual Tile Management turned off, (Right) The Active Tile controls with Manual Tile Management turned on, and additional controls for manual tile management displayed

So, now we've created a custom overall layout, and we've tailored the top clip in the stack to fit the first tile in the layout. Now it's time to apply this effect to the next two clips in the stack (remember the bottom clip will be used as a background, so it doesn't need this plug-in applied to it). Select the top clip with the effect applied to it in the Timeline, and press Command-C to copy it. Then, select the next two clips, right-click one of them, and choose Paste Attributes (Option-V). When the Paste Attributes window appears, turn on the Plugins checkbox, in Video Attributes and click Apply. Those two clips disappear as they receive the Video Montage effect and fit themselves into Tile 1, just like the top clip.
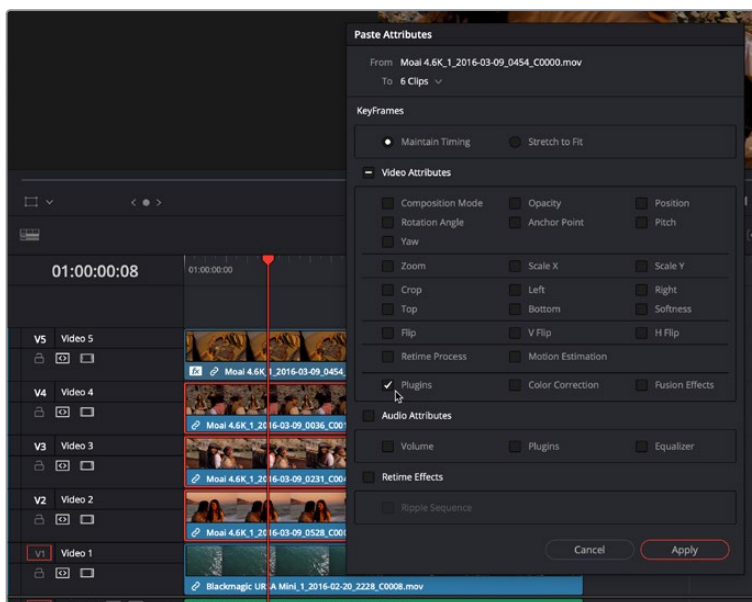
Using Paste Attributes to apply the copied effect from the top clip to the other clips in this arrangement

To assign each clip to the correct tile in the layout, select each clip in the arrangement, one at a time, open the Effects panel of the Inspector, click the Tiles button in the Inspector (if necessary), and set each clip to be the next available tile in the Active Tile drop-down menu. In this example, the top clip was in Tile 1, the second clip down will be in Tile 2, and the third clip down will be in Tile 3.
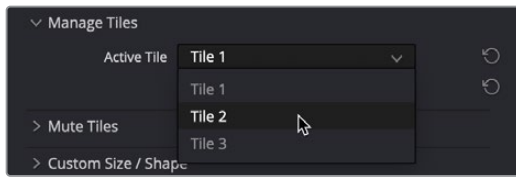
Assigning the Active Tile for each layer in the Timeline

TIP: If you enable the Open FX Overlay of the Timeline Viewer, each tile has an overlay that lets you click a tile in the Viewer to make that the Active Tile.

If you like, you can rearrange which clips go into which tiles using this control, but for now we'll keep things simple. As you do this, each tile becomes populated, and the final layout is revealed, with the background clip showing behind everything. If necessary, you can use the Resize Content controls (in Tiles mode) to resize each tile's contents to fit the tile better.

The current layout, with each clip in the stack assigned to a different tile

NOTE: If you've customized a layout, copied and pasted attributes to the other clips you want to use in that layout, and have assigned each clip to its position in the layout, and you then decide you need to make a change to the Globals layout controls, you'll need to go through the process of copying the updated effect, pasting attributes to the other clips, and reassigning each clip to the appropriate position in the layout to make that update to the other clips as well.

So, these are the overall workflows of the Video Collage effect. There is, of course, much more you can do, but this is the basis of how you create your initial layout.

Animating Tiles and Advanced Layouts

One of the more powerful aspects of the Video Collage effect is the ability to quickly and easily create animated intros and outros for each tile. These effects can be fully automated over a customizable duration, or their duration can be manually keyframed. All animations can be automatically eased, and you can also enable motion blur for the Fly, Shrink, and Rotate animations.

When you use these controls in Create Background mode, the transparent holes through which other clips in the background show through are animated to "open or close" to reveal the contents. When used in Create Tile mode, the actual tile and its contents are animated to fly, shrink, rotate, and/or fade to appear or disappear.
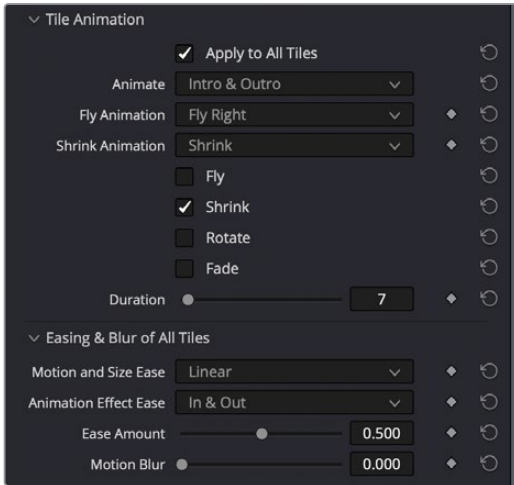
Tile Animation controls let you create automatic Intro and/or Outro animations

Additionally, you have the ability to keyframe the Mute, Start and End Column and Row parameters, Tile Styling and Drop Shadow parameters, and other aspects of tiles in Tiles mode, either individually or all together.

In particular, the Start and End Column and Row parameters let you create tiles that span multiple grid positions, and also move tiles from one grid position to another. Without keyframing, this lets you create more kinds of layouts with asymmetric arrangements of large and small tiles. With keyframing, you gain the ability to easily create sophisticated grid-based animations to move tiles from position to position, and to have tiles expand and contract to encompass neighboring tiles in the layout, all with a minimum of keyframing.

Tile Animation controls let you create automatic Intro and/or Outro animations

Keep in mind that, when using multiple instances of the Video Collage effect on superimposed clips in the Timeline, once you've defined your overall layout and used Paste Attributes to copy a particular instance of this effect with your layout to the rest of the clips, you need only keyframe each instance of each tile within the clip it's applied to. Furthermore, since Intro and Outro animations are applied to the entire duration of the clip, you can easily offset each Intro and Outro animation by offsetting the clips in the timeline.

> **TIP:** If you change the duration of clips in a stack that are creating a Video Collage effect, you can use the Synchronize Keyframing controls in Globals mode to offset all keyframes applied to that instance of the Video Collage effect by the same amount. You could do the same thing by opening the keyframe track or Curve Editor for all Video Collage parameters in the Timeline and offsetting them that way, but this provides a quick shortcut.

Video Collage Controls

Here's a detailed explanation of all the parameters found in the Video Collage effect.

- **Workflow:** Defines what the output of Video Collage is, depending on how you want to use it.
  - **Create Background:** Outputs a frame with holes, behind which you can position individual layers of video to show through.
  - **Create Tile:** Outputs a single tile, transformed and styled to be one element of a multi-tile layout

- **Preview Layout:** Turning on Preview Layout lets you see a graphical preview the entire layout, and how each tile fits together. In Create Tile mode, this lets you configure how you want the layout to look before you copy the clip and use paste attributes to apply this effect to the rest of the video layers you want to arrange into a split-screen.

- **Globals / Tile buttons:** Choose between the Globals controls, which exposes controls that let you adjust the overall layout, and the Tiles controls, which let you choose the currently active tile and style it.

Layout

These controls appear in Globals mode.

- **Columns:** Choose how many vertical columns worth of tiles there are.
- **Rows:** Choose how many horizontal rows worth of tiles there are.
- **Stagger Horizontally:** Lets you create an offset from one row from the next in a balanced way, so that the rows are all staggered from one another.
- **Stagger Vertically:** Lets you create an offset from one column from the next in a balanced way, so that the columns are all staggered from one another.
- **Rounding:** Rounds the edges of each tile in the layout. A value of 0.000 sets the edges to be square. Increasing rounding increasingly curves the corners of each tile, until a value of 1 sets the tile to be perfectly round.

Margins and Spacing

These controls appear in Globals mode.

- **Left/Right Margins:** Alters the spacing from the edge of the frame to the left and right edges of the group of all tiles. Increasing this parameter makes all tiles progressively more narrow, as they squeeze in towards the center of the frame.

- **Top/Bottom Margins:** Alters the spacing from the edge of the frame to the top and bottom edges of the group of all tiles. Increasing this parameter makes all tiles progressively shorter, as they squeeze in towards the center of the frame.

- **Horizontal and Vertical Offset:** These two sliders let you offset the group of all tiles from the center however you like.

- **Horizontal and Vertical Spacing:** These two sliders increase or decrease the spacing between each tile, making them narrower or wider as a result.

Synchronize Keyframing

These controls appear in Globals mode. They're basically a built-in utility that lets you offset all Globals and Tiles parameter keyframes that are applied to the current effect, to account for times when you've done elaborate keyframing to create animated split-screen effects, and you then need to change the duration of the clip this effect is applied to. Instead of forcing you to expose the keyframes of each parameter in the Timeline in order to move them, these controls let you move all keyframes for all parameters forward or backward by a particular number of frames, all at once.

- **Offset Frames:** Lets you specify how many frames you want to offset all keyframes applied to this effect forward. Negative values move keyframes to the left.

- **Apply Keyframing Offset:** Executes the offset.

Manage Tiles

These controls appear in Tiles mode.

- **Active Tile:** This menu serves two purposes. First, it defines which tile the current clip is displayed within. This becomes important later on when you apply this effect to other superimposed clips you want to use together in a layout. However, this control also determines which tile you further customize using the Tile-based controls of the Inspector. If you enable the Open FX Overlay of the Timeline Viewer, each tile has its own overlay that lets you click a tile in the Viewer to make that the Active Tile.

- **Bring Tile Forward/Send Tile Back:** These two buttons let you rearrange the order of tiles in the Active Tile drop-down menu.

- **Manual Tile Management:** While this checkbox is turned off (the default), changing the Columns and Rows parameters automatically updates the Active Tile drop-down menu with one tile per node on the resulting grid arrangement. Turning this checkbox on lets you Add and Delete tiles manually, which lets you create more advanced layouts with overlapping tiles and asymmetric spacing between tiles.

Mute Tiles

These controls appear in Tiles mode. A single checkbox parameter, Mute Tile, lets you enable and disable the visibility of the active tile. This checkbox is keyframable, so you can animate the appearance and disappearance of different tiles to create different effects.

Custom Size/Shape

These controls appear in Tiles mode. They let you further customize layouts on a tile by tile basis and can also be used to quickly and easily animate a single tile to move and resize itself around the grid of the overall layout.

- **Start/End Column and Row:** These four controls serve two purposes, letting you change a tile's position by row and column number, or enlarge a tile to encompass multiple tile row or column positions ("spanning"). To use these parameters, you must first choose which tile you want to adjust from the Active Tile drop-down menu. With the tile you want to edit tile active, you can then drag the appropriate sliders to create either effect, as explained below.

  - **To change Tile Position:** When adjusted together so that the Start and End values are identical, they let you manually adjust the position of each tile in the grid that's defined by the number of rows and columns you've set. This is particularly useful when you want to quickly keyframe animated changes to tile position, in order to jump a tile around the grid of the layout.

– **To make a tile span multiple positions:** Setting the Start and End Row and/or Column parameters to different values, changes the currently active tile to span multiple grid positions in the layout, making that tile bigger in order to create asymmetric arrangements of larger and smaller tiles. You can also keyframe these values to easily animate the effect of a tile expanding to occupy more grid positions, or shrinking from occupying several grid positions to occupying a single position. Choose how many rows/columns and in which directions you want that tile to span. Note that if you span multiple rows or columns that have been offset, the resulting tile is enlarged to encompass the entire rectangular region defined by the outer boundaries of both offset tiles.

- **Custom Size/Shape:** Turning this checkbox on enables the rest of the controls in this group, enabling you to set individual scale and rounding for the active tile that's selected.

- **Custom Scale:** Lets you adjust the size of the active tile independently of the other tiles.

- **Custom Rounding:** Lets you adjust the rounding of the active tile independently of the other tiles.

Resize Content

These controls appear in Tiles mode. They let you resize the image being fit within each tile to show exactly what you want shown.

- **Pan/Tilt/Zoom:** These three sliders let you move and resize the video layer shown inside of the active tile to fit however you need it to.

- **Edge Behavior:** These settings allow you to control how the edges of the video layer respond inside the tile.

  – **Transparent:** Any positioning that goes past the edge of the video is transparent, showing the Tile Color set in the Tile Styling options.

  – **Reflect:** Any positioning that goes past the edge of the video mirrors back on itself.

  – **Wrap:** Any positioning that goes past the edge of the video repeats itself.

  – **Replicate:** Any positioning that goes past the edge of the video shows a duplicate of the edge stretched to the boundary of the control, essentially filling in the remaining space with the pixels used at the extreme edges of the video clip.

- **Move With Tile:** Defines how the image is fit into the tile when the tile size changes due to other parameters of the Video Collage effect.

  – **Position Only:** The video content in the tile only is sized using Pan and Tilt, Zoom is ignored.

  – **Position and Scale:** The video content in the tile is sized using Pan, Tilt, and Zoom.

Tile Styling

These controls appear in Tiles mode. They let you add a colored border, and adjust the opacity of all tiles, or just the currently active tile. These parameters are animatable.

- **Apply to All Tiles:** When checked, this applies any changes made in the Tile Styling parameters to all tiles in the Video Collage, regardless of which tile is currently active.

- **Tile Border:** This slider controls the width of the tile's border. It has a possible range of values from -0.250 to 0.250, where negative numbers expand the size of the border inside the tile, and positive numbers expand it outside the tile.

- **Tile Color:** Allows you to chose the background and border color of the tile.
- **Tile Opacity:** This slider changes the transparency of the tile itself; it does not effect the video clip inside the tile. The possible ranges are 0.000 (fully transparent) to 1.000 (fully opaque).

Drop Shadow

These controls appear in Tiles mode. They let you add and customize a drop shadow, either to all tiles, or just to the currently active tile. These parameters are animatable.

- **Apply to All Tiles:** When checked, this applies any changes made in the Drop Shadow parameters to all tiles in the Video Collage, regardless of which tile is currently active.
- **Strength:** This slider controls drop shadow transparency. The possible ranges are 0.000 (fully transparent) to 1.000 (fully opaque).
- **Color:** Allows you to choose the color of the Drop Shadow.
- **Drop Angle:** Lets you set the angle that the shadow is cast from. The slider represents 360 degrees of movement from -180.0 to 180.0.
- **Drop Distance:** Allows you to set the distance that the shadow appears from its source tile. The possible values are from 0.000 to 0.200.
- **Expand:** This slider controls how far the shadow expands from its origin. The possible values are from 0.900 to 1.250.
- **Blur:** Allows you to control the amount of diffusion of the Drop Shadow. The possible ranges are 0.000 (no blur) to 1.000.

Tile Animation

These controls appear in Tiles mode. They make it easy to create simple intro/outro animations to bring all or some tiles onscreen, and to push all or some tiles offscreen, in different ways. The Animate drop-down menu determines whether this animation will be automatic or manually created using keyframes.

- **Apply to All Tiles:** When enabled, any animation that's set up will be applied to all tiles in the layout simultaneously.
- **Animate:** This drop-down menu lets you choose between Manually Keyframing intro or outdo animations, or automatically creating animations to introduce or conclude a tile. The options are:
- **Manually Keyframe:** In this mode, you must manually keyframe the four progress sliders below to create animated Intro and Outro animations.
- **Intro Only:** Animation is automatically created to bring each tile onscreen according to the types of animation you choose from four checkboxes below. Options include Fly, Shrink, Rotate, and Fade, in any combination. A Duration slider appears that lets you choose how long the Intro will be.
- **Outro Only:** Animation is automatically created to send each tile offscreen according to the types of animation you choose from four checkboxes below. Options include Fly, Shrink, Rotate, and Fade, in any combination. A Duration slider appears that lets you choose how long the Outro will be.
- **Intro & Outro:** Animation is automatically created to bring each tile onscreen and then send each tile offscreen, according to the types of animation you choose from four checkboxes below. Options include Fly, Shrink, Rotate, and Fade, in any combination. A Duration slider appears that lets you choose how long the Intro and Outro will be.
- **Fly Animation:** Lets you choose a direction for tiles to fly in from and fly out to.

- **Shrink Animation:** Lets you choose a method of shrinking out or in when the Fly Progress slider is animated.

- **Fly Progress:** (manual key framing only) A slider that, when animated, lets you fly a tile into or out of the frame. A value of 0.000 positions the tile in its default grid position. A value of 1.000 positions the tile entirely off screen.

- **Shrink Progress:** (manual key framing only) A slider that, when animated, lets you shrink a tile down to nothing or up to the current size. A value of 0.000 sizes the tile at its largest state. A value of 1.000 shrinks the tile to nothing.

- **Rotate Progress:** (manual key framing only) A slider that, when animated, lets you fly a tile into or out of the frame. A value of 0.000 positions the tile in its default grid position. A value of 1.000 positions the tile entirely off screen.

- **Fade Progress:** (manual key framing only) A slider that, when animated, lets you fly a tile into or out of the frame. A value of 0.000 positions the tile in its default grid position. A value of 1.000 positions the tile entirely off screen.

Easing & Blur

These controls appear in Tiles mode. They let you adjust the easing of the tile animation created in the previous group of controls.

- **Motion and Size Ease:** These controls set the curve used for simulated momentum in animating the Tile Position and Size keyframes of the tiles.
  - **None:** No curves are applied. The animation snaps immediately from keyframe to keyframe.
  - **Linear:** No easing curves are applied, motion is neither accelerated or decelerated.
  - **In:** The animation curve starts slower and ends faster.
  - **Out:** The animation curve starts faster and ends slower.
  - **In & Out:** The animation curve starts slower, accelerates in the middle, and slows down at the end.

- **Animation Effects Ease:** These controls set the curve used for simulated momentum in animating the Tile Animation keyframes of the tiles.
  - **None:** No curves are applied. The animation snaps immediately from keyframe to keyframe.
  - **In:** The animation curve starts slower and ends faster.
  - **Out:** The animation curve starts faster and ends slower.
  - **In & Out:** The animation curve starts slower, accelerates in the middle, and slows down again at the end.

- **Ease Amount:** The relative strength of the animation curve in speeding up and slowing down. The values range from 0.000 to 1.000

- **Motion Blur:** This slider controls the amount of motion blur added to the animation, in order to make it smoother and more organic looking. The values range from 0.000 (no motion blur), to 1.000 (maximum motion blur).

Global Blend

- **Blend:** This slider controls the overall opacity of the entire Video Collage effect. The values range from 0.000 (completely transparent) to 1.000 (completely opaque).

3D Keyer (Resolve FX Key)

Based on the 3D Qualifier in the Color page, the 3D Keyer offers a fast, simple way of pulling a key to isolate a range of color in the image by dragging your mouse pointer over the parts of the image you want to key. Each time you drag over the image you add to or subtract from the cloud of values you're carving out of a three-dimensional representation of all available colors; you don't see this representation, but this "under the hood" functionality is what gives the 3D Keyer its name.

> **TIP:** If you're looking to isolate a range of luma values in the image, you should use the HSL or Luma keyer.

The 3D Keyer is a good one to start with if you're trying to key a blue screen or green screen background. Its interface of dragging the mouse pointer over the screen color you want to remove, coupled with its high quality and extreme specificity, makes it a fast and accurate tool to use in a variety of circumstances. The 3D Keyer's greatest strength is the speed with which you can sample areas of the picture to extract from the final key. However, this can also be a weakness if your initial samples aren't giving you satisfactory results because, unlike the Delta Keyer in the Fusion page, there aren't many ways to fine-tune the key as it's being generated. On the other hand, for well-lit subjects you want to key, two or three samples is all you need.

General

The top set of controls allows you to set up the 3D Keyer for the initial sampling.

- **Colorspace:** This pop-up menu lets you choose whether you're sampling colors in YUV colorspace or HSL colorspace. YUV is the default, but if you find you're not getting satisfactory results, you can reset the 3D Keyer and switch to HSL to see if that works any better.

- **Softness:** A single parameter lets you adjust the overall softness of the matte created by the 3D Keyer. The default value is 50. Raising this value increases matte softness, lowering it decreases matte softness.

- **Despill:** If you're using the 3D Keyer to pull a blue or green screen key to create transparency, this checkbox lets you turn on an automatic color correction that eliminates blue or green spill from the image while retaining the image's original color.

- **Show Paths:** A checkbox that lets you turn the visibility of the lines you're drawing to sample the image on and off. Turning lines off does not affect the key in any way.

Selection Range Controls

The Selection Range buttons in the Inspector let you define a key by sampling pixels in the Viewer with the mouse pointer.
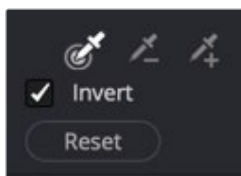
3D Keyer Selection Range controls

- **Sample Eyedropper:** This is the first control you use whenever sampling the image. It defines the initial range of the keyer; you must use this tool before any of the others. In the Edit page, the Timeline Viewer Overlay must be set to Open FX. Clicking once with this tool selects a single pixel value, while clicking and dragging selects a range of image values that add together.
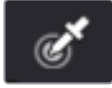
3D Sample Picker button

- **Add/Subtract Color Range:** These two controls let you add samples to, or subtract them from, the currently selected screen color range that defines the core of the key. As with the eyedropper, you can drag over a range of colors.
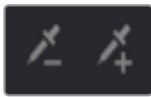
Add and Subtract
Color Range buttons

- **Invert:** Inverts the sampled screen color to become opaque, and areas not sampled transparent.
- **Reset:** Resets all the sampled colors while retaining the general control settings.

Matte Finesse

You may find that sampling the screen color is not enough to overcome some problems. Issues such as chattery edges, holes, or noisy bits can sometimes be easily fixed using the Matte Finesse controls. These controls filter the output of the Keyer and are adjustments that are made to the matte itself, so they may work well in some instances and poorly in others, depending on what you're trying to do.

- **Denoise:** Denoise provides a distinct way to selectively reduce the noise in a key, getting rid of stray areas of screen color and softly filling "holes" in a matte.
- **Clean Black:** Clean Black is a specialized operation that eliminates noise (seen as white speckling when viewing a high-contrast highlight) in the black area of a key that omits the regions of the image you don't want to isolate, and shrinks the key by making the dark parts of a key darker the higher you raise this parameter, pushing dark gray areas of the key toward black. The practical result is that raising Clean Black lets you "fill holes" in the background portion of a key and erode translucent edges.
- **Clean White:** Clean White is another specialized operation that eliminates noise (seen as black speckling when viewing a high-contrast highlight) in the white portion of a key that include areas of the image you're isolating, and expands the key by making light parts of a key lighter the higher you raise this parameter, pushing light gray areas of the key toward white. The practical result is that raising Clean White lets you "fill holes" in the foreground portion of a key and grow translucent edges.
- **Blur Radius:** In small amounts, blurring a key does well to take the edge off problem edges. However, blurring a key can also feather the edges of a key past the border of the subject you're keying, with the result being a visible "halo" around your subject, depending on the adjustment you're making. The range is 0 to 2000, with 0 being the default. With such a large maximum blur radius, combined with the capabilities that the In/Out Ratio provides in customizing the direction of spread, you can turn some pretty precarious mattes into surprisingly smooth and useful results.

- **In/Out Ratio:** Controls whether the "Blur Radius" is applied equally to the inside and outside of the edge of the matte (zero), applied only within the matte (negative values), or applied only outside the matte (positive values). Using In/Out Ratio can help eliminate fringing when using the Blur Radius parameter. However, you can also use In/Out Ratio even in situations where no Blur Radius is applied at all. Raising In/Out Ratio will fill in small black holes in the matte, while lowering In/Out Ratio below 0 will eliminate speckling by pushing small white bits of the matte toward black.

- **Black Clip:** Raising Black Clip applies a "lift" adjustment such that translucent areas of the matte (gray areas when viewing a high-contrast highlight) are pushed toward black. The range is 0 to 100, with 0 being the default setting.

- **White Clip:** Lowering White Clip applies a "gain" adjustment such that translucent areas of the matte (gray areas when viewing a high-contrast highlight) are pushed toward white. The range is 0 to 100, with 100 being the default setting.

- **Operation:** This menu lets you choose how you want to modify the alpha channel/key. You can choose Shrink or Grow to dilate or erode the edges of the matte with great accuracy. Or, you can choose Opening or Closing to plug or expand holes to clean up a ragged matte.

- **Shape:** This menu lets you choose how corners and angles in the edges of the key are handled when you grow or shrink it. Circle is the default and results in even expansion around the surface of the key that eventually averages all angles into a circular shape if you use extreme radius settings. Square averages all angles into a more rectangular shape if you use extreme radius settings. Diamond averages all angles into a diamond shape if you use extreme radius settings.

- **Radius:** Adjusts how much to shrink, grow, open, or close the key.

- **Inters:** The Iterations slider alters the effect of the Operator Radius setting to create more extreme adjustments.

Garbage Matte

These controls let you crop out unwanted things in the frame that are also being keyed, such as lighting fixtures, boom microphones, tracking patches, etc.

- **Matte Shape:** You can choose either a Rectangle or Ellipse with which to crop around the subject you're keying. Choosing None turns off Garbage Matte. When a garbage matte is enabled, the Open FX Overlay mode of the Viewer shows an on-screen control for adjusting the shape and position of the garbage matte.

- **Edge Softness:** Lets you soften the edges. Defaults to 50; the range is 0 (no softening) to 100 (maximum softening).

- **Invert:** Inverts the garbage matte.

Garbage Matte Location

These controls provide numeric parameters for adjusting and keyframing garbage mattes.

- **Center X and Y:** Lets you adjust and keyframe the position of a garbage matte.

- **Bounding Width and Height:** Lets you adjust the width and height of the garbage matte.

Output

The Output controls let you choose how the image is output, composited, and displayed in the Viewer.

- **Output:** This menu offers three options for which channels are output from the effect.
  - **Alpha Highlight:** Displays the transparent part of an alpha channel as gray and the solid part of an alpha channel in full color.
  - **Alpha Hilight B/W:** Displays the black and white alpha channel, which is often helpful when sampling additional areas to key.
  - **Final Composite:** The keyed image is displayed composited over any video track below it.

- **Use Alpha:** A common control in many Resolve FX and 3rd party Open FX plug-ins; this checkbox determines if the alpha channel is used when compositing over another video track. It can be used instead of choosing RGB Only (Blank Alpha) from the Output menu.

To use the 3D Keyer in the Edit page:

1. Apply the 3D Keyer to a green screen or blue screen clip that's on a higher track than the background.

2. In the Inspector, enable the Show Paths checkbox to view the sampled areas once you begin.

3. From the Viewer Overlay menu in the lower-left corner of the Timeline Viewer, choose Open FX Overlays.

4. In the Viewer, click and drag to draw a sampling stroke across the screen color you want to remove.

5. The transparency immediately takes effect, showing the keyed subject against whatever clip appears on the video track underneath it in the Timeline as a composite. To see the matte you created for further adjustment, choose Alpha Highlight or Alpha Highlight B/W from the Output drop-down menu.

6. If necessary, you can add or subtract areas from the screen color selection using the add/subtract Color range controls. Alternatively, with the default Sample eyedropper selected, you can hold down Shift to add to the screen color selection or hold down the Option key to remove from the screen color selection.

Ordinarily, it's a good idea not to select more than two or three times. If you make too many selections in the image, the result can be a key with hard, jagged edges that can sometimes be more difficult to adjust later on.

HSL Keyer (Resolve FX Key)

Based on the HSL Qualifier in the Color page, the HSL Keyer is a general-purpose keyer that uses three color components, hue, saturation, and luma, to define a key. In many instances, the HSL Keyer is not as immediately accurate as the 3D Keyer and will include a broader portion of the image for any given sample. On the other hand, if the 3D Keyer is not giving you satisfactory results for a particular shot, the HSL Keyer can sometimes do a better job. The HSL Keyer also gives you the option of disabling color components that you don't want to contribute to the final key. You can pull a saturation-only key, or a hue-only key, for instances where that may solve the issue at hand.

The most straightforward way to use any keyer is to sample the image in the Viewer. When you sample one or more pixels, the Hue, Saturation, and Luma values are analyzed and set different ranges. There are several eyedropper controls available to sample color and soften the selection.

Selection Range Controls

The Selection Range buttons in the Inspector let you define a key by sampling and softening pixels in the Viewer with the mouse pointer.
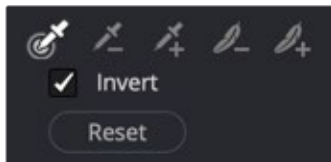
HSL Keyer Color Range controls

- **Sample Eyedropper:** This is the first control you use whenever sampling the image. It defines the initial range of the qualification; you must use this tool before any of the others. Clicking once with this tool selects a single pixel value, while clicking and dragging selects a range of image values that add together.

- **Add/Subtract Color Range:** These two controls let you add areas of the image to, or subtract them from, the currently selected inner range of values that define the core of the key. As with the eyedropper, you can click on single pixels or drag over a range of color.

- **Add/Subtract Softness:** These two controls let you redefine the softness that transitions from the inner range of the key, falling off towards the outer edge of the key. Like the other sampling controls, you can click on single pixels or drag over a range of color.

- **Invert:** Inverts the sampled color to become opaque, and areas not sampled become transparent.

- **Reset:** Resets all the sampled colors while retaining the general control settings.

Keyer Options

One of the HSL Keyer's strengths, and one of its most underutilized features, is that you can enable or disable each of the three HSL components using the Hue, Sat, and Lum checkboxes. This lets you ignore specific color components while focusing on others that may be more important. For example, if you're trying to key the saturated parts of an image, regardless of the hue or brightness, you can turn off Hue and Lum so that only Sat is used to sample it.
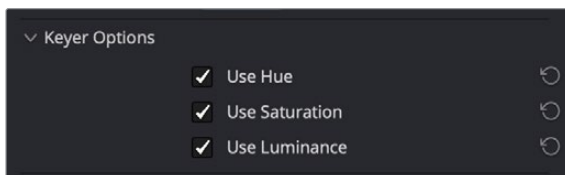
HSL Keyer options

Matte Finesse

You may find that sampling the screen color is not enough to overcome some problems. Issues such as chattery edges, holes, or noisy bits can sometimes be easily fixed using the Matte Finesse controls. These controls filter the output of the Keyer and are adjustments that are made to the matte itself, so they may work well in some instances and poorly in others, depending on what you're trying to do.

- **Denoise:** Denoise provides a distinct way to selectively reduce the noise in a key, getting rid of stray areas of screen color and softly filling "holes" in a matte.

- **Clean Black:** Clean Black is a specialized operation that eliminates noise (seen as white speckling when viewing a high-contrast highlight) in the black area of a key that omits the regions of the image you don't want to isolate, and shrinks the key by making the dark parts of a key darker the higher you raise this parameter, pushing dark gray areas of the key toward black. The practical result is that raising Clean Black lets you "fill holes" in the background portion of a key and erode translucent edges.

- **Clean White:** Clean White is another specialized operation that eliminates noise (seen as black speckling when viewing a high-contrast highlight) in the white portion of a key that include areas of the image you're isolating, and expands the key by making light parts of a key lighter the higher you raise this parameter, pushing light gray areas of the key toward white. The practical result is that raising Clean White lets you "fill holes" in the foreground portion of a key and grow translucent edges.

- **Blur Radius:** In small amounts, blurring a key does well to take the edge off problem edges. However, blurring a key can also feather the edges of a key past the border of the subject you're keying, with the result being a visible "halo" around your subject depending on the adjustment you're making. The range is 0 to 2000, with 0 being the default. With such a large maximum blur radius, combined with the capabilities that the In/Out Ratio provides in customizing the direction of spread, you can turn some pretty precarious mattes into surprisingly smooth and useful results.

- **In/Out Ratio:** Controls whether the "Blur Radius" is applied equally to the inside and outside of the edge of the matte (zero), applied only within the matte (negative values), or applied only outside the matte (positive values). Using In/Out Ratio can help eliminate fringing when using the Blur Radius parameter. However, you can also use In/Out Ratio even in situations where no Blur Radius is applied at all. Raising In/Out Ratio will fill in small black holes in the matte, while lowering In/Out Ratio below 0 will eliminate speckling by pushing small white bits of the matte toward black.

- **Black Clip:** Raising Black Clip applies a "lift" adjustment such that translucent areas of the matte (gray areas when viewing a high-contrast highlight) are pushed toward black. The range is 0 to 100, with 0 being the default setting.

- **White Clip:** Lowering White Clip applies a "gain" adjustment such that translucent areas of the matte (gray areas when viewing a high-contrast highlight) are pushed toward white. The range is 0 to 100, with 100 being the default setting.

- **Operation:** This menu lets you choose how you want to modify the alpha channel/key. You can choose Shrink or Grow to dilate or erode the edges of the matte with great accuracy. Or, you can choose Opening or Closing to plug or expand holes to clean up a ragged matte.

- **Shape:** This menu lets you choose how corners and angles in the edges of the key are handled when you grow or shrink it. Circle is the default and results in even expansion around the surface of the key that eventually averages all angles into a circular shape if you use extreme radius settings. Square averages all angles into a more rectangular shape if you use extreme radius settings. Diamond averages all angles into a diamond shape if you use extreme radius settings.

- **Radius:** Adjusts how much to shrink, grow, open, or close the key.
- **Inters:** The Iterations slider alters the effect of the Operator Radius setting to create more extreme adjustments.

Garbage Matte

These controls let you crop out unwanted things in the frame that are also being keyed, such as lighting fixtures, boom microphones, tracking patches, etc.

- **Matte Shape:** You can choose either a Rectangle or Ellipse with which to crop around the subject you're keying. Choosing None turns off Garbage Matte. When a garbage matte is enabled, the Open FX Overlay mode of the Viewer shows an on-screen control for adjusting the shape and position of the garbage matte.
- **Edge Softness:** Lets you soften the edges. Defaults to 50; the range is 0 (no softening) to 100 (maximum softening).
- **Invert:** Inverts the garbage matte.

Garbage Matte Location

These controls provide numeric parameters for adjusting and keyframing garbage mattes.

- **Center X and Y:** Lets you adjust and keyframe the position of a garbage matte.
- **Bounding Width and Height:** Lets you adjust the width and height of the garbage matte.

Output

The Output controls let you choose how the image is output, composited, and displayed in the Viewer.

- **Output:** This menu offers three options for which channels are output from the effect.
  - **Alpha Highlight:** Displays the transparent part of an alpha channel as gray and the solid part of an alpha channel in full color.
  - **Alpha Hilight B/W:** Displays the black and white alpha channel, which is often helpful when sampling additional areas to key.
  - **Final Composite:** The keyed image is displayed composited over any video track below it.

- **Use Alpha:** A common control in many Resolve FX and 3rd party Open FX plug-ins; this checkbox determines if the alpha channel is used when compositing over another video track. It can be used instead of choosing RGB Only (Blank Alpha) from the Output menu.

To use the HSL Keyer in the Edit page:

1   Apply the HSL Keyer to a clip on video track 2 or higher.

2   From the Viewer Overlay menu in the lower-left corner of the Timeline Viewer choose Open FX Overlays.

3   Click and drag across the screen color you want to remove.

4   The transparency immediately takes effect, showing the keyed subject against whatever clip appears on the video track underneath it in the Timeline as a composite. To see the matte you created for further adjustment, choose Alpha Highlight or Alpha Highlight B/W from the Output drop-down menu.

5 To add or subtract from the matte, click the plus or minus Color Range control, and click or drag across the portion of the keyed image.

6 To add softness to the outer range of the key you're creating, click the plus Softness control and then click or drag across the portion of the image you'd like to include as a soft edge.

Luma Keyer (Resolve FX Key)

Based on the Luma Qualifier in the Color page, the Luma Keyer pulls a key from the Luma channel. It's identical to the HSL Keyer with H and S turned off. Although not often used by itself, the Luma Keyer can produce very dramatic effects when used in conjunction with Composite modes.

Selection Range Controls

The Selection Range buttons in the Inspector let you define a key by sampling pixels in the Viewer with the mouse pointer.
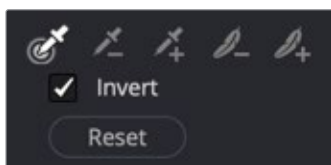
Luma Keyer Selection Range controls

- **Sample Eyedropper:** The first control you use whenever sampling the image. It defines the initial range of the keyer; you must use this tool before any of the others. In the Edit page, the Timeline Viewer Overlay must be set to Open FX. Clicking once with this tool selects a single pixel value, while clicking and dragging selects a range of image values that add together.

- **Add/Subtract Luma Range:** These two controls let you add areas of the image to, or subtract them from, the currently selected Luma range that defines the core of the key. As with the eyedropper, you can click on single pixels, or drag over a range of color.

- **Add/Subtract Softness:** These two controls let you redefine the softness that transitions from the inner range of the key, falling off towards the outer edge of the key. Like the other keying controls, you can click on single pixels, or drag over a range of color.

- **Invert:** Inverts the sampled luma range to become opaque, and areas not sampled become transparent.

- **Reset:** Resets the sampled luma range while retaining the Output control settings.

Matte Finesse

You may find that sampling the screen color is not enough to overcome some problems. Issues such as chattery edges, holes, or noisy bits can sometimes be easily fixed using the Matte Finesse controls. These controls filter the output of the Keyer and are adjustments that are made to the matte itself, so they may work well in some instances and poorly in others, depending on what you're trying to do.

- **Denoise:** Denoise provides a distinct way to selectively reduce the noise in a key, getting rid of stray areas of screen color and softly filling "holes" in a matte.

- **Clean Black:** Clean Black is a specialized operation that eliminates noise (seen as white speckling when viewing a high-contrast highlight) in the black area of a key that omits the regions of the image you don't want to isolate, and shrinks the key by making the dark parts of a key darker the higher you raise this parameter, pushing dark gray areas of the key toward black. The practical result is that raising Clean Black lets you "fill holes" in the background portion of a key and erode translucent edges.

- **Clean White:** Clean White is another specialized operation that eliminates noise (seen as black speckling when viewing a high-contrast highlight) in the white portion of a key that include areas of the image you're isolating, and expands the key by making light parts of a key lighter the higher you raise this parameter, pushing light gray areas of the key toward white. The practical result is that raising Clean White lets you "fill holes" in the foreground portion of a key and grow translucent edges.

- **Blur Radius:** In small amounts, blurring a key does well to take the edge off problem edges. However, blurring a key can also feather the edges of a key past the border of the subject you're keying, with the result being a visible "halo" around your subject depending on the adjustment you're making. The range is 0 to 2000, with 0 being the default. With such a large maximum blur radius, combined with the capabilities that the In/Out Ratio provides in customizing the direction of spread, you can turn some pretty precarious mattes into surprisingly smooth and useful results.

- **In/Out Ratio:** Controls whether the "Blur Radius" is applied equally to the inside and outside of the edge of the matte (zero), applied only within the matte (negative values), or applied only outside the matte (positive values). Using In/Out Ratio can help eliminate fringing when using the Blur Radius parameter. However, you can also use In/Out Ratio even in situations where no Blur Radius is applied at all. Raising In/Out Ratio will fill in small black holes in the matte, while lowering In/Out Ratio below 0 will eliminate speckling by pushing small white bits of the matte toward black.

- **Black Clip:** Raising Black Clip applies a "lift" adjustment such that translucent areas of the matte (gray areas when viewing a high-contrast highlight) are pushed toward black. The range is 0 to 100, with 0 being the default setting.

- **White Clip:** Lowering White Clip applies a "gain" adjustment such that translucent areas of the matte (gray areas when viewing a high-contrast highlight) are pushed toward white. The range is 0 to 100, with 100 being the default setting.

- **Operation:** This menu lets you choose how you want to modify the alpha channel/key. You can choose Shrink or Grow to dilate or erode the edges of the matte with great accuracy. Or, you can choose Opening or Closing to plug or expand holes to clean up a ragged matte.

- **Shape:** This menu lets you choose how corners and angles in the edges of the key are handled when you grow or shrink it. Circle is the default and results in even expansion around the surface of the key that eventually averages all angles into a circular shape if you use extreme radius settings. Square averages all angles into a more rectangular shape if you use extreme radius settings. Diamond averages all angles into a diamond shape if you use extreme radius settings.

- **Radius:** Adjusts how much to shrink, grow, open, or close the key.

- **Inters:** The Iterations slider alters the effect of the Operator Radius setting to create more extreme adjustments.

Garbage Matte

These controls let you crop out unwanted things in the frame that are also being keyed, such as lighting fixtures, boom microphones, tracking patches, etc.

- **Matte Shape:** You can choose either a Rectangle or Ellipse with which to crop around the subject you're keying. Choosing None turns off Garbage Matte. When a garbage matte is enabled, the Open FX Overlay mode of the Viewer shows an on-screen control for adjusting the shape and position of the garbage matte.
- **Edge Softness:** Lets you soften the edges. Defaults to 50, the range is 0 (no softening) to 100 (maximum softening).
- **Invert:** Inverts the garbage matte.

Garbage Matte Location

These controls provide numeric parameters for adjusting and keyframing garbage mattes.

- **Center X and Y:** Lets you adjust and keyframe the position of a garbage matte.
- **Bounding Width and Height:** Lets you adjust the width and height of the garbage matte.

Output

The Output controls let you choose how the image is output, composited, and displayed in the Viewer.

- **Output:** This menu offers three options for which channels are output from the effect.
  - **Alpha Highlight:** Displays the transparent part of an alpha channel as gray and the solid part of an alpha channel in full color.
  - **Alpha Hilight B/W:** Displays the black and white alpha channel, which is often helpful when sampling additional areas to key.
  - **Final Composite:** The keyed image is displayed composited over any video track below it.
- **Use Alpha:** A common control in many Resolve FX and 3rd party Open FX plug-ins; this checkbox determines if the alpha channel is used when compositing over another video track. It can be used instead of choosing RGB Only (Blank Alpha) from the Output menu.

To use the Luma Keyer in the Edit page to key a subject:

1 Apply the Luma Keyer to a clip on video track 2 or higher.

2 From the Viewer Overlay menu in the lower-left corner of the Timeline Viewer choose Open FX Overlays.

3 Either click a pixel in a bright or dark part of the image you want to key out, or click and drag across a range of pixels within that subject.

4 The transparency immediately takes effect, showing the keyed subject against whatever clip appears on the video track underneath it in the Timeline as a composite. To see the matte you created for further adjustment, choose Alpha Highlight or Alpha Highlight B/W from the Output drop-down menu.

5 To add or subtract from the matte, click the plus or minus Luma Range buttons, and then click or drag across the portion of the keyed image.

6 To add softness to the outer range of the key you're creating, click the plus Softness button and then click or drag across the portion of the image you'd like to include as a soft edge.

Smear (Resolve FX Temporal, Studio Only)

The Smear effect simulates motion blur in a clip by blending a user-definable number of frames.

- **Frames Either Side:** Determines the number of frames that are blended on either side of the current frame. For instance, entering a value of 2 uses two frames before and two frames after the current frame to create the effect.

- **Luma Threshold:** This control sets how bright a pixel must be to contribute to the smear effect. A lower value causes only darker pixels to be smeared. A higher value includes brighter pixels in the effect.

- **Chroma Threshold:** This control sets how saturated a pixel must be to contribute to the smear effect. A lower value causes only low saturated pixels to be smeared. A higher value includes more saturated pixels in the effect.

Motion Trails (Resolve FX Temporal, Studio Only)

The Motion Trails effect copies the image to create ghost-like trails on moving images. This effect can be used to simulate clips shot with long shutter speeds and analog video feedback effects.

General

The first two sliders control the number and strength of the copied frames.

- **Trail Length:** Determines the number of copies that are used to create the trails.

- **Dropoff:** Sets the fade applied to each copied frame. The Dropoff value is compounded. For instance, using a value of .5 applies 50% opacity to the first copy, 25% to the second, 12.5% to the third, and so on.

Advanced Options

The advanced options are used to control how the overlapping copied frames are blended.

- **Composite Gamma:** The Composite Gamma menu provides four options for controlling the brightness of the overlapping frames.

  - **Timeline:** Uses the Timeline Color Space setting in the Project Settings to control the overlapping brightness. This setting, by default, is Rec. 709, Gamma 2.4.

  - **Rec. 709:** Uses a Rec. 709 color space with Gamma 2.2 to control the overlapping brightness.

  - **Linear:** Uses Linear Gamma often producing much stronger highlights.

  - **Custom:** Provides a custom gamma slider which defaults to Gamma of 2.4. Setting this to a value of 1.0 is the same as setting the menu to Linear.

- **Input Alpha:** There are three choices in the Input Alpha menu that determine how the alpha channel is used for blending the frames. All three options assume there is an alpha channel present on the clip that has the Motion Trail applied.

  - **Ignore:** This is the default option and will cause the alpha channel to be ignored. Disabling the Use Alpha checkbox when Ignore is selected will cause the alpha to act as a stencil effect for the trails.

  - **Onto Current:** Uses the alpha channel for the trails, but instead of compositing it over the lower video track, the trails are composited over themselves using the current frame.

  - **Onto Black (Alpha Out):** This option uses the alpha channel for the trails and compositing over the lower video track, assuming the Use Alpha checkbox is enabled.

Move Trail

This group of controls determines the offset, direction, size, and rotation of the copies. Adjustment amounts are applied as offsets from one copy to the next. For instance, if rotation is set to 5 degrees, the first trail copy is rotated 5 degrees, the second trail copy is rotated 10 degrees, the third copy is rotated 15 degrees, and so on.

- **Pan:** Adjusts the offset of the trail copies from the original image.
- **Pan Angle:** Changes the angle at which the trails are offset from the original image. The values are shown in degrees.
- **Zoom:** Adjust a scale adjustment, successively, to each copy.
- **Rotate:** Applies an angle of rotation, successively to each copy.
- **Reuse Current Frame:** When this checkbox is disabled (the default), each copy uses the frame after the copy before it. For instance, the first copy is the current frame -1, and the second copy is the current frame -2. When this checkbox is enabled, all copies use the same frame as the current frame in the clip.
- **Border Type:** This menu determines how edges of the frame are handled when the copies are scaled smaller than the timeline resolution.
  - **Black:** The area outside the image is set to black.
  - **Replicate:** Duplicates the outermost pixels along the edge of the image. The pixels are stretched out from each side to reach the timeline resolution boundary.
  - **Reflect:** The image is flipped and flopped to create a mirrored image that extends to the timeline resolution frame boundary.
  - **Wrap-Around:** Duplicates the image to create a video wall effect, used to fill in the space to the timeline resolution frame boundary.

Global Blend:

- **Blend:** The Blend slider controls the mix between the effected image and the original image.
- **Use Alpha:** If an alpha channel exists in the image, this checkbox determines if the alpha channel is used when compositing over another video track. When using an image with an alpha channel, this checkbox must be enabled, and the Input Alpha menu must be set to Onto Black (alpha out) for the trails to be composited over a lower video track.

Noise Reduction (Resolve FX Revival, Studio Only)

Based on the Noise Reduction controls in the Color page, the Resolve FX Noise Reduction is divided into two types of GPU-accelerated noise reduction designed to subdue noise in problematic clips. Both methods of noise reduction can be used separately or together, in varying amounts depending on the needs of the particular material you're working on.

Temporal NR Controls

The Temporal NR controls analyze images across multiple frames to isolate noise from detail. Motion estimation settings let you exclude moving subjects from this operation to prevent unwanted motion artifacts.

- **Frames Either Side:** The number of frames on either side of the current frame that you want averaged to separate detail from the noise. You can choose between 0 and 5 frames. 0 applies no frame averaging; higher values apply more frame averaging, at the expense of being significantly more computationally intensive. A higher frame setting may yield a better analysis, but may also yield unwanted artifacts if there are fast-moving images in the frame. A value of 1 may yield better results for fast-moving images. If you need to use higher frame values, but see artifacts, you can also try adjusting the Motion Threshold to fix the issue.

- **Motion Est. Type:** Picks the method DaVinci Resolve uses to detect motion in the image. The default, Faster, is less processor intensive, but less accurate. Choosing Better can effectively exclude motion more accurately, but is more processor intensive. None lets you disable motion estimation altogether, resulting in the application of Temporal NR to the entire image.

- **Motion Range:** Three settings, Small, Medium, and Large, let you set the speed of motion that Motion Estimation should expect to exclude. A Small setting assumes slow-moving subjects with little or no motion blur, allowing Temporal NR to affect more of the image at a given Motion Threshold setting. A Large setting assumes fast motion with blur occupying a larger area of the image, which excludes more of the image from Temporal NR at the same Motion Threshold setting. Choose the setting that gives you the best compromise between reducing noise and the introduction of motion artifacts when adjusting the Motion Threshold parameter.

Temporal Threshold Controls

The Temporal Threshold parameters allow you to control which image characteristics get more or less noise reduction.

- **Luma Threshold:** Lets you determine how much or how little Temporal NR to apply to the luma component of the image. The range is 0–100, where 0 applies no noise reduction at all, and 100 is the maximum amount. Too high a setting may eliminate fine detail from the image.

- **Chroma Threshold:** Determines how much Temporal NR os applied to the chroma component of the image. The range is 0–100, where 0 applies no noise reduction at all, and 100 is the maximum amount. Too high a setting may eliminate fine color detail from the image. However, you may find you can raise the Chroma Threshold higher than the Luma Threshold with less noticeable artifacting.

- **Gang Luma Chroma:** Ordinarily, the Luma and Chroma Threshold parameters are ganged together so that adjusting one adjusts both. However, disabling this checkbox ungangs these parameters, allowing you to adjust different noise reduction amounts to each component of the image, depending on where the noise happens to be worst.

- **Motion:** Defines the threshold separating which moving pixels are in motion (above this threshold) versus which moving pixels are static (below this threshold). Using Motion Estimation, Temporal NR is not applied to regions of the image that fall above this threshold, to prevent motion artifacts by not applying frame-averaging to parts of the image that are in motion. Lower values omit more of the image from Temporal NR by considering more subtle movements. Higher values apply Temporal NR to more of the image by requiring faster motion for exclusion. You can choose between 0 and 100, where 0 applies Temporal NR to no pixels, and 100 applies Temporal NR to all pixels. The default value is 50, which is a suitable compromise for many clips. Be aware that if you set too high a Motion Threshold, you may see artifacts in moving parts of the image.

- **Blend:** Lets you dissolve between the image as it's being affected by the Temporal NR parameters (at 0.0) and the image with no noise reduction (100.0). This parameter lets you easily split the difference when using aggressive temporal noise reduction.

Spatial NR Controls

The Spatial NR controls let you smooth out regions of high-frequency noise throughout the image, while attempting to avoid softening by preserving detail. It's effective for reducing noise that Temporal NR can't.

- **Mode:** The Mode drop-down menu lets you switch Spatial NR between three different algorithms. All three modes of operation use the same controls, so you can switch between modes using the same settings to compare your results.

- **Faster:** Uses a computationally lightweight method of noise reduction that's good at lower settings, but may produce artifacts when applied at higher values.

- **Better:** Switches the Spatial NR controls to use a higher quality algorithm that produces greatly superior results to Faster, at the expense of being more processor intensive to render and not allowing you to decouple the Luma and Chroma Threshold sliders for individual adjustments to each color component.

- **Enhanced:** Does a significantly better job preserving image sharpness and detail when raising the Spatial Threshold sliders to eliminate noise. This improvement is particularly apparent when the Spatial Threshold sliders are raised to high values (what constitutes "high" varies with the image you're working on). At lower values, the improvement may be more subtle when compared to the "Better" mode, which is less processor intensive than the computationally expensive "Enhanced" setting. Additionally, "Enhanced" lets you decouple the Luma and Chroma threshold sliders so you can add different noise reduction amounts to each color component, as the image requires.

- **Radius:** Options include Large, Medium, and Small. A smaller radius offers greater real-time performance and can provide good quality when using low Luma and Chroma Threshold values. However, you may see more aliasing in regions of detail when using low NR Threshold values.

  Setting Radius to be progressively larger results in higher quality within areas of greater visual detail at high Luma and Chroma Threshold values, at the expense of slower performance. An NR Radius of Medium should provide suitable quality for most images when using medium NR Threshold settings. As with many operations, there's an adjustable tradeoff between quality and speed.

Spatial Threshold Controls

The Spatial Threshold parameters allow you to control which image characteristics get more or less noise reduction.

- **Luma:** Lets you determine how much or how little noise reduction to apply to the luma component of the image. The range is 0–100, where 0 applies no noise reduction at all, and 100 is the maximum amount. Too high a setting may eliminate fine detail from the image.

- **Chroma:** Lets you determine how much or how little noise reduction to apply to the chroma component of the image by smoothing out regions of high-frequency noise while attempting to preserve the sharpness of significant edge details. The range is 0–100, where 0 applies no noise reduction at all, and 100 is the maximum amount. Too high a setting may eliminate fine color detail from the image. However, you may find you can raise the Chroma Threshold higher than the Luma Threshold with less noticeable artifacting.

- **Gang Luma Chroma:** Ordinarily, the Luma and Chroma Threshold parameters are ganged together so that adjusting one adjusts both. However, you can ungang these parameters to adjust different amounts of noise reduction to each component of the image. For example, if an image softens too much at a certain level of noise reduction, but you find more color speckling than luma noise, you can lower the Luma Threshold to preserve detail while raising the Chroma Threshold to eliminate color noise.

- **Blend:** Lets you dissolve between the image as it's being affected by the Spatial NR parameters (at 0.0) and the image with no noise reduction (100.0). This parameter lets you easily split the difference when using aggressive spatial noise reduction.

Global Blend

- **Blend:** Lets you dissolve between the image with no noise reduction (1.0) and the image with both Spatial NR and Temporal NR at their current settings (0.0).

Using Noise Reduction

The following procedure suggests a method of using the Noise Reduction (NR) parameters to achieve a controlled result.

Applying noise reduction to an image:

1   Enable Temporal NR by choosing 1 to 5 frames from the Number of Frames pop-up menu. Keep in mind that more frames dramatically increase the render time of this effect, while it may or may not significantly improve the result, depending on your material.

2   Choose options from the Motion Est. Type and Motion Range drop-down menus corresponding to how much motion is in the image. If there's a lot of motion, you may need to choose Better and Large. If there's not very much motion, lesser settings may suffice.

3   With Luma and Chroma Threshold linked, slowly raise either parameter until you just start to see a reduction in noise within nonmoving areas. Then make smaller adjustments to determine the maximum amount you can add without creating artifacts or overly softening detail.

4   If there's obviously more chroma than luma noise in the image, you can disable Luma/Chroma linking at a satisfactory level of luma noise reduction, and then raise the Chroma Threshold to address color speckling in the picture.

5   Suppose you're not satisfied with the tradeoff between the maximum possible threshold of noise reduction and the prevention of motion artifacts. In that case, you may want to adjust the Motion Threshold setting, lowering it to omit more of the motion from the noise reduction operation, or raising it to include more motion. If you're still not satisfied, you can also try better Motion Est. Type and Motion Range settings.

    Keep in mind that the strength of Temporal NR is to reduce noise in unmoving parts of the image. When you've achieved the best tradeoff between noise reduction in the still areas and avoidance of motion artifacts in the moving areas of the image, it's time to turn to Spatial NR to further eliminate noise throughout the rest of the picture.

6   Enable Spatial NR by raising either the Luma or Chroma Threshold parameters, which are linked by default, until you strike a suitable balance between the reduction of noise and an unwanted increase in image softness.

7   It's recommended to choose the Enhanced option from the Spatial NR mode pop-up, as it will yield the best possible results. However, this can be processor-intensive, so if you need better real-time performance, you can switch the mode to Faster and compare results.

8 If there's obviously more chroma than luma noise in the image, you can disable Luma/Chroma linking at a satisfactory level of luma noise reduction, and then raise the Chroma Threshold to apply more aggressive Spatial NR to address color speckling in the picture.

9 If you've had to use a high Spatial NR Luma or Chroma Threshold setting to reduce noise visibly, and areas of detail look a bit chunky or aliased, you can choose a larger setting from the Radius pop-up menu to enable a more detailed analysis of the scene.

This will result in higher visual quality, but larger NR Radius settings are more processor-intensive and may reduce real-time performance if you don't have adequate GPU resources available to your system.

10 If you've found suitable noise reduction settings, but the result is too aggressive and makes the image appear too processed, you can try raising the Spatial NR and/or Temporal NR Blend parameters to fade between the noise reduction added by each set of controls, and the image as it was before you added noise reduction.

Try Applying Temporal NR First, then Applying Spatial NR

Because Temporal NR analyzes multiple frames for its noise isolation, it tends to be better at preserving detail accurately in regions of the image where there's little motion. If you try applying Temporal NR first and get a successful result, even if only in part of the image, you may reduce how much Spatial NR you have to apply, thus improving the overall quality of your final result.

Keep in mind that while Temporal NR does a great job in unmoving parts of an image but is less effective when dealing with subjects in motion, Spatial NR can reduce noise everywhere in the frame falling below its threshold, even when there's motion. Ultimately, a combination of the two is almost always going to be a winning combination.

Spatial NR Radius, How Large Should You Go?

Larger NR Radius settings can dramatically improve the quality of high-detail regions in shots where you're using aggressive Spatial noise reduction, but it's not necessary to always jump to the large Radius setting, which provides the highest precision. In many cases, when evaluating an image that you're applying noise reduction to, you may not be able to perceive the additional quality. You'll waste processing time on an unnecessary level of correction.

It's a good idea to evaluate the full-frame image on a large enough display to see the noise you're working on within the viewing context of the intended audience. Zooming really far into a clip while applying noise reduction may encourage you to use higher quality settings than are necessary because an excessively enlarged detail of an image lets you see subtle changes that you wouldn't notice at actual size.
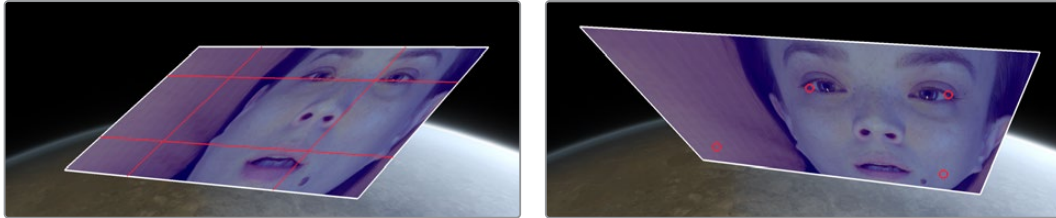
Transform (Resolve FX Transform)

The Transform Resolve FX adds considerable control over the standard transforms in the Inspector's Sizing or the Color page Sizing Palette. This effect includes all the standard Position, Tilt, Zoom, and Rotate controls but adds corner pinning, two kinds of on-screen controls, motion blur, and Edge behavior controls.

General

- **Control Mode:** This drop-down menu includes three methods for controlling the transforms. One is based on sliders in the Inspector while the other two are based on manipulating the Viewer's image.

  - **Sliders:** Uses sliders and checkboxes in the Inspector to control the transforms. This method has no Viewer overlays with which to control the position, scale, or rotation but provides exact control using numeric values.

  - **Interactive-Canvas:** Choosing this mode moves the controls from the Inspector to the Timeline Viewer. The Viewer's controls are shown as a bold white outline and four vertices, one at each corner. You can drag on any part of the white outline for stretching, squeezing, and corning pinning. Dragging the center of the image repositions the frame. The red subdivision overlays make it easy to create shearing effects by dragging line segments to move two corners simultaneously.

  - **Interactive-Pins:** Adjusting the image in this mode is done by manually placing control points, called pins, in the timeline viewer. Adding one pin only gives you position control. At least two points are required for scaling and rotation. Dragging on one of the pins scales or rotates the image around the other pin. Using three pins, you can create perspective distortions by dragging any one of the pins. You can add up to four pins for unique corner pinning distortions.

> **TIP:** You can Option-Click on a pin to remove it or use the Reset Canvas button to remove all the pins.

Resolve FX Transform Interactive Canvas mode (Left) and Interactive Pin mode (Right)

Only one Control mode can be active at a time. For instance, you cannot make adjustments with the sliders and then switch to one of the interactive methods. The sliders will be reset to once a different method is selected. However, can you apply two Transform effects to a clip, adjusting one with Sliders and the other using an interactive method.

Control Options

- **Canvas Keyframe:** Only displayed when the Control mode is set to Interactive-Canvas or Interactive-Pins. The Canvas Keyframe has no control except for a keyframe button allowing you to keyframe the changes you make in the Viewer.

- **Reset Canvas:** Resets any interactive changes made in the Viewer, and any keyframes created from those changes.

- The following parameters are only displayed when the Control Mode is set to Sliders.

- **Position X and Y:** Moves the image within the frame, allowing pan and scan adjustments to be made. X moves the image left or right, and Y moves the image up or down.

- **Zoom:** Allows you to blow the image up or shrink it down.

- **Rotate:** Rotates the image around the center.
- **Flip Horizontal/Vertical:** Two checkboxes let you flip the image in different dimensions.
  - **Flip Horizontal:** Reverses the image along the X-axis, left to right.
  - **Flip Vertical:** Reverses the clip along the Y-axis, turning it upside down.

- **Width:** Stretch or squeeze the image in one direction only.
- **Height:** Stretch or squeeze the image in one direction only.
- **Pitch:** Rotates the image toward or away from the camera along an axis running through the center of the image, from left to right. Positive values push the top of the image away and bring the bottom of the image forward. Negative values bring the top of the image forward and push the bottom of the image away. Higher values stretch the image more extremely.
- **Yaw:** Rotates the image toward or away from the camera along an axis running through the center of the image from top to bottom. Positive values bring the left of the image forward and push the right of the image away. Negative values push the left of the image away and bring the right of the image forward. Higher values stretch the image more extremely.

Advanced Options

- **Edge Behavior:** This menu determines how edges of the frame are handled when the transforms are scaled smaller than the timeline resolution.
  - **Black:** The area outside the transformed image is set to black.
  - **Reflect:** The image is flipped and flopped to create a mirrored image, which extends to the timeline resolution frame boundary.
  - **Wrap-Around:** Duplicates the image to create a video wall effect, which is used to fill in the space to the timeline resolution frame boundary.
  - **Replicate:** Duplicates the outermost pixels along the edge of the image. The pixels are stretched out from each side to reach the timeline resolution boundary.

- **Motion Blur:** Keyframing the transform so the frame moves rapidly will create a blurring effect. The amount of the blur is controlled using the Motion Blur slider.

Global Blend

- **Blend:** Lets you dissolve between the image with no Transform applied and one with the Transform fully applied.

False Color (Resolve FX Color, Studio Only)

False Color is a creative effect that can be used for replicating camera HUDs, infrared sensors, and custom posterization looks by defining a set number of colors for the clip. The color set can either match the False Color setting in a specific Blackmagic Design camera or be picked from a list of creative style presets. The presets can be modified by setting the number of colors used and defining the tonal range each color represents.

Resolve FX False Color Thermal Preset and Legend

General

- **Plugin Mode:** This menu is used to switch between using a specific Blackmagic Design Camera's False Color setting or accessing creative presets. When Specific Camera Model is chosen, the Camera Model section is displayed for selecting the camera and settings you want to use. When Creative is chosen, the Color bands section is displayed for choosing and customizing the preset.

Camera Model

The Camera Model controls are displayed when Specific Camera Model is chosen from the Plugin Model menu. These menus allow you to match the False Color from a camera configuration.

- **Camera:** Selects the exact Blackmagic Design camera sensor.
- **Camera Mode:** Selects the dynamic range setting.
- **ISO Level:** Sets the ISO or light sensitivity setting.

Color Bands

These controls are displayed when Creative is chosen from the Plugin Model menu. The Color Bands group of controls are used to select and modify the appearance of the False Color presets.

- **Camera:** Selects the exact Blackmagic Design camera sensor.
- **Camera Mode:** Selects the dynamic range setting.
- **ISO Level:** Sets the ISO or light sensitivity setting.

Preprocessing

This group of controls is used to apply tonal and blur processing to the image.

- **Blur:** Applies a blur filter to the False Color.
- **Black Level:** Increases or decreases the shadow range assigned to colors that fall lower on the False Color legend.
- **White Level:** Increases or decreases the highlight range assigned to colors that fall higher on the False Color legend.
- **Gamma:** Shifts the mid-tone range towards colors that fall lower or higher on the False Color legend.

Scale/Legend

This section is used to control the visibility and appearance of the False Color Legend. The Legend is displayed to help viewers understand the color representation. Whenever you apply False Color, the Legend is generated and displayed. When you modify a preset, the Legend automatically updates to represent the new color scheme.

- **Show Scale:** Shows or hides the Legend on the left side of the frame.
- **Show Values:** Shows or hides numeric values on the Legend. These numeric values represent different scales based on the Value Style menu.
- **Show Labels:** Shows or hides data point labels on the Legend. The labels identify important data points along the tonal range, such as black clipping, white clipping, and middle gray.
- **Contrast:** Increases or decreases the transparency of the Legend's background underlay.
- **Value Detail:** Increases or decreases the number of axis value labels displayed on the Legend.
- **Value Style:** This menu includes three options for the scale used for the Legend's numeric values.
  - **Percentage:** Uses a percentage scale for the Legend, going from 0% at the bottom to 100% at the top.
  - **Hundredths:** Uses a Hudrenths scale for the Legend, going from 0 at the bottom to 100 at the top.
  - **Normalized:** Uses a Normalized scale for the Legend, going from 0.0 at the bottom to 1.0 at the top.

Global Blend

- **Blend:** Lets you dissolve between the image with no False Color applied (0.0) and the image with False Color fully applied (1.0).

Improvements to Existing Resolve FX

There are also numerous improvements to previously existing Resolve FX.

Improved Object Removal (Resolve FX Revival, Studio Only)

The Object Removal effect has been improved to be more automatic when it's applied to a node in which you're use a window, qualifier key, matte, or some other kind of key to isolate the object to be removed. In this case, the node's Use OFX Alpha option (seen in the contextual menu when you right-click on the node) is automatically turned on, so the internal key is automatically used.

Quality has also been improved. There's better spatial positioning of the textures that are generated to remove the object, and there's better temporal consistency in the resulting clean plate that's created. Bottom line, the synthesized clean plate used to "fill the hole" where the object you're removing was is higher quality than before.

Lastly, a new Scene Mode drop-down menu provides different methods of analyzing the scene, for improving the analysis of how the area that needs to be replaced moves, to best determine how to fill the hole left by the object being removed. Background analyzes the entire image except for the object region. Boundary analyzes the boundary area surrounding the object region. Object is for analyzing an object that moves with the background, like a sticker that's on a window while the camera moves.

Improved Dead Pixel Fixer (Resolve FX Revival, Studio Only)

The Dead Pixel Fixer has been significantly improved, with more ways of identifying and eliminating not just dead pixels, but other kinds of larger blemishes in the frame of an image. There are new ways of defining areas to fix, new modes with which to execute the fix, and new fill methods and patch options for finessing the results of the fix.

In many respects, the Dead Pixel Fixer is similar to the Dust Buster, however the Dust Buster effect is designed to repair transient bits of dust and dirt that only last for a frame or two, whereas the Dead Pixel Fixer is designed to work on blemishes that are fixed in place for the duration of a clip.

Dead Pixel Fixer

These top level controls let you choose how to draw patches with which to repair blemishes in the frame, whether or not to show their on-screen controls, and how.

- **Patch Style:** There are three different kinds of patches you can draw to deal with different kinds of blemishes in the frame.
  - **Draw Rect:** Click and drag to place a rectangular patch of any size from one corner to the opposite corner. Once drawn, you can click on any edge of the overlay and drag to reposition it.
  - **Draw Ellipse:** Click and drag to place an elliptical patch of any size from one corner to the opposite corner. Once drawn, you can click on any edge of the overlay and drag to reposition it.
  - **Place Patch:** Lets you place small patches specifically for tiny details such as dead pixels. When you choose this option, a New Patch Size slider appears that lets you adjust the size of the patches you're about to place prior to placing them. Once drawn, you can click on the edge of any patch and drag to reposition it.

- **New Patch Size:** (only when Place Patch is selected) Lets you choose how large of a patch to place using the Place Patch tool.

- **Show Patches:** This checkbox lets you show or hide the onscreen outline of every patch in the Viewer.

- **Hide During Interaction :** Hides the onscreen outline of every patch in the Viewer while you're moving a patch; this makes it easier to see the effect of moving the patch on the image, without the outline getting in the way.

Patch Type

There are three methods you can use to attempt to fix the contents of a selected patch. When drawing new patches, the currently selected Patch Type will determine what the next patch will be. When you've selected an existing patch, changing the Patch Type will change how that patch works.

- **Spatial:** Automatically fills the interior of the selected patch with pixels drawn from the surroundings of the patch, using the Fill Method. This works well for small blemishes, but for large blemishes a pattern might be discernible, which gives away the effect.

- **Clone:** Clone mode copies part of the image to fill a shape or patch placed over the thing you want to remove. In this mode, clicking and dragging to place a Rect or Ellipse over an imperfection is followed by a second click to place the sample region you want to clone. Clicking once to place a Patch will be followed by a second click to place the sample region. Selecting an existing shape or patch and choosing Clone lets you click on the shape to position the clone region. The sample region is indicated by a dotted shape that's connected to the original shape.

- **Blend Clone:** Operates similarly to Clone mode, except the copied part of the image that fills the Rect, Ellipse, or Patch is blended with the image to integrate it more softly.

- **Fill Method:** When using the Spatial Patch Type, the fill method determines how the blemish in the image is repaired.

  - **Grid:** Samples the pixels surrounding the Rect, Ellipse, or Patch, and blurs them inward both horizontally and vertically. Extremely effective for tiny blemishes. For larger blemishes, a grid-like pattern may emerge.

  - **Horizontal:** Samples the pixels to the left and right of the Rect, Ellipse, or Patch, and blurs them inward.

  - **Vertical:** Samples the pixels to the top and bottom of the Rect, Ellipse, or Patch, and blurs them inward.

  - **Patchy:** Samples pixels from all around the Rect, Ellipse, or Patch, and expands and blurs them together to create a soft, non-uniform region with which to repair the blemish. Doesn't have the patterning of the grid methods of fill, but produces an extremely smooth result.

  - **Smooth:** Simply uses a gaussian blur to repair the blemish.

Patch Options

These options let you customize the effect of a patch filling over a blemish.

- **Mute:** Lets you turn a particular patch on or off via keyframing. Useful for blemishes that only show up for a few pixels of a shot.

- **Variability:** (Spatial patches only) Raising this parameter lets you make the Fill Method less uniform.

- **Soft Edges:** Lets you soften the edges of the patch.

- **Size Adjust:** Lets you change the size of a patch after its creation.

Advanced Controls

These controls let you customize the UI of this effect.

- **Clone Sticks to Mouse:** When enabled, drawing or placing a Rect, Ellipse, or Patch in Clone or Blend Clone mode immediately switches to positioning the sample region, making it faster to use.

- **New Patches Stay Selected:** When enabled, patches stay selected after you draw them, in preparation for further customization.

- **UI Line Thickness:** Lets you choose how thick the on-screen outlines should be.

- **Patches Stick to:** This parameter lets you deal with fixing dead pixels or blemishes on clips that have been stabilized.

  - **Source:** Patches you place stay put, unless you apply motion stabilization to the shot, in which case the patches are transformed along with the image so they remain "stuck" to the feature in the source clip they're fixing.

  - **Scene:** If you're eliminating a blemish on a moving subject, you can use the FX Tracker to track the thing you're fixing, so the patch follows along with it.

- **Output Mode:** This lets you see different representations of the patched effect you're creating. There are four options.

  - **Patched Result:** The final result, with each patch repairing the blemish it's covering.

  - **Patch Locations:** Shows a key where each placed patch is white against black.

  - **Differences:** Shows the difference of each patch against the original image.

  - **Difference Magnitude:** Shows a more pronounced Differences representation.

Improved Dust Buster (Resolve FX Revival, Studio Only)

The Dust Buster Resolve FX plug-in has been improved to provide more options for isolating dust and blemishes with Ellipses and Patches, and with the option to repair dust and dirt using the Clone and Blend Clone methods. In many respects, the Dust Buster is similar to the Dead Pixel Fixer, however the Dust Buster effect is designed to repair transient bits of dust and dirt that only last for a frame or two, whereas the Dead Pixel Fixer is designed to work on blemishes that are fixed in place for the duration of a clip.

Dust Buster

These top level controls let you choose how to draw patches with which to repair temporally unstable dust and dirt in the frame, whether or not to show their on-screen controls, and how.

- **Navigation Controls:** Four buttons let you jump to frames on which you've drawn patches. There are four buttons:

  - **First Modified Frame:** Jumps the playhead to the first frame of that clip with a patch.

  - **Last Modified Frame:** Jumps the playhead to the last frame of that clip with a patch.

  - **Next Modified Frame:** Jumps the playhead to the next frame forward with a patch.

  - **Last Modified Frame:** Jumps the playhead to the last frame back with a patch.

- **Patch Style:** There are three different kinds of patches you can draw to deal with different kinds of blemishes in the frame.
    - **Draw Rect:** Click and drag to place a rectangular patch of any size from one corner to the opposite corner. Once drawn, you can click on any edge of the overlay and drag to reposition it.
    - **Draw Ellipse:** Click and drag to place an elliptical patch of any size from one corner to the opposite corner. Once drawn, you can click on any edge of the overlay and drag to reposition it.
    - **Place Patch:** Lets you place small patches specifically for tiny details such as dead pixels. When you choose this option, a New Patch Size slider appears that lets you adjust the size of the patches you're about to place prior to placing them. Once drawn, you can click on the edge of any patch and drag to reposition it.

- **New Patch Size:** (only when Place Patch is selected) Lets you choose how large of a patch to place using the Place Patch tool.
- **Show Patches:** This checkbox lets you show or hide the onscreen outline of every patch in the Viewer.
- **Hide During Interaction :** Hides the onscreen outline of every patch in the Viewer while you're moving a patch; this makes it easier to see the effect of moving the patch on the image, without the outline getting in the way.

Patch Type

There are six methods you can use to attempt to fix the contents of a selected patch. When drawing new patches, the currently selected Patch Type will determine what the next patch will be. When you've selected an existing patch, changing the Patch Type will change how that patch works.

- **Auto:** The default method. Once you've drawn a bounding box, the two frames prior to and the two frames after the current clip will be analyzed and compared to the current image. The best of these 5 frames will be sampled to remove the imperfection in the current frame. Images two frames away are prioritized since that will avoid the appearance of frozen grain, but only if they're a suitable match to the content of the current frame.
- **+/- 1 Frame:** In this mode, if you draw a bounding box from left to right, the next frame will be drawn upon to remove the imperfection. If you draw a bounding box from right to left, the previous frame will be used.
- **+/- 2 Frames:** If you draw a bounding box from left to right, the image two frames forward will be drawn upon to remove the imperfection. If you draw a bounding box from right to left, the image two frames back will be used.
- **Spatial:** Automatically fills the interior of the selected patch with pixels drawn from the surroundings of the patch, using the Fill Method. This works well for small blemishes, but for large blemishes a pattern might be discernible, which gives away the effect.
- **Clone:** Clone mode copies part of the image to fill a shape or patch placed over the thing you want to remove. In this mode, clicking and dragging to place a Rect or Ellipse over an imperfection is followed by a second click to place the sample region you want to clone. Clicking once to place a Patch will be followed by a second click to place the sample region. Selecting an existing shape or patch and choosing Clone lets you click on the shape to position the clone region. The sample region is indicated by a dotted shape that's connected to the original shape.

- **Blend Clone:** Operates similarly to Clone mode, except the copied part of the image that fills the Rect, Ellipse, or Patch is blended with the image to integrate it more softly.
- **Fill Method:** When using the Spatial Patch Type, the fill method determines how the blemish in the image is repaired.
  - **Grid:** Samples the pixels surrounding the Rect, Ellipse, or Patch, and blurs them inward both horizontally and vertically. Extremely effective for tiny blemishes. For larger blemishes, a grid-like pattern may emerge.
  - **Horizontal:** Samples the pixels to the left and right of the Rect, Ellipse, or Patch, and blurs them inward.
  - **Vertical:** Samples the pixels to the top and bottom of the Rect, Ellipse, or Patch, and blurs them inward.
  - **Patchy:** Samples pixels from all around the Rect, Ellipse, or Patch, and expands and blurs them together to create a soft, non-uniform region with which to repair the blemish. Doesn't have the patterning of the grid methods of fill, but produces an extremely smooth result.
  - **Smooth:** Simply uses a gaussian blur to repair the blemish.

Patch Options

These options let you customize the effect of a patch filling over a blemish.

- **Mute:** Lets you turn a particular patch on or off via keyframing. Useful for blemishes that only show up for a few pixels of a shot.
- **Variability:** (Spatial patches only) Raising this parameter lets you make the Fill Method less uniform.
- **Soft Edges:** Lets you soften the edges of the patch.
- **Size Adjust:** Lets you change the size of a patch after its creation.

Advanced Controls

These controls let you customize the UI of this effect.

- **Clone Sticks to Mouse:** When enabled, drawing or placing a Rect, Ellipse, or Patch in Clone or Blend Clone mode immediately switches to positioning the sample region, making it faster to use.
- **New Patches Stay Selected:** When enabled, patches stay selected after you draw them, in preparation for further customization.
- **UI Line Thickness:** Lets you choose how thick the on-screen outlines should be.
- **Output Mode:** This lets you see different representations of the patched effect you're creating. There are four options.
  - **Patched Result:** The final result, with each patch repairing the blemish it's covering.
  - **Patch Locations:** Shows a key where each placed patch is white against black.
  - **Differences:** Shows the difference of each patch against the original image.
  - **Difference Magnitude:** Shows a more pronounced Differences representation.

Improved Directional, Radial, and Zoom Blurs
(Resolve FX Blur, Studio Only)

Additional options are available for creating more photo-realistic directional, radial and zoom blurs.

Directional

- **Blur Type:** When Blur Type is set to Realistic, the blur effect emulates a photographic motion blur. When set to Stylized, the blur effect is a simple and smooth digital blur.

- **Symmetric Blur:** When the Symmetric checkbox is turned on, the blur effect appears to be created from both directions, with the result being more of a double-image that's blurring along the blur angle, simulating motion blur in a camera. When off, the blur effect appears to be moving in a single direction, from the original position out along the blur angle.

Radial Blur

- **Blur Type:** When Blur Type is set to Realistic, the blur effect emulates a photographic motion blur. When set to Stylized, the blur effect is a simple and smooth digital blur.

- **Blur Symmetry:** Three options are available.

  - **Symmetric:** The blur effect appears to be created in both directions, with the result being more of a double-image that's blurring in an arc around the X/Y Position, simulating motion blur in a camera.

  - **Clockwise:** The blur effect appears to be moving in a single, clockwise direction.

  - **Anti-Clockwise:** The blur effect appears to be moving in a single, counter-clockwise direction.

Zoom Blur

- **Blur Type:** When Blur Type is set to Realistic, the blur effect emulates a photographic motion blur. When set to Stylized, the blur effect is a simple and smooth digital blur.

- **Zoom Amount:** When Blur Type is set to Realistic, this slider becomes bi-directional. The center is 0, or no blur at all. Dragging to the right expands the blur effect outward from the position. Dragging to the left shrinks the image towards the Position, blurring outward from there.

Improved Film Grain (Resolve FX Texture, Studio Only)

Film Grain has a new Optimized Mode checkbox, located in the Advanced Controls. With this checkbox turned on (the default), performance should improve substantially.

Chapter 9

Fairlight Page Improvements

DaVinci Resolve 17 continues to expand and evolve the Fairlight page. The completely redesigned Fairlight Audio Engine allows for simultaneous playback of up to 1,000 tracks with no additional hardware and 2,000 tracks when used with the Fairlight PCI Audio Accelerator. The new Flexbus structure completely upgrades Fairlight's bus capabilities, offering users the option for bus-to-bus, track-to-bus, or bus-to-track signal routing. All of these additional tracks and Flexbus features have expanded Fairlight's Dolby Atmos capabilities to include the import, export, and manipulation of Atmos ADM files.

Contents

New Format Support

DaVinci Resolve 17 introduces the following audio format support.

Ability to Decode and Encode MP3 Audio on Linux

Linux users have the added ability to encode and decode MP3 files in Fairlight.

Expanded Dolby Atmos Capabilities

DaVinci Resolve 17 significantly improves Dolby Atmos mixing. The traditional surround sound experience outputs a specific set of monitoring channels that requires a specific number of monitor speakers placed in particular areas of a room, which can position sound approximately within a ring around the listener. Dolby Atmos improves upon this by being an object-based sound system operating within a 3D immersive space that can accommodate a wider variety of different speaker configurations using more speakers positioned around the listener. This increases dimensionality with more precise sound placement, adding height channels to produce sound that comes specifically from above.

A practical example of this difference can be heard when panning in a 7.1 mix; since you're sending signals to specific points in a speaker array, those points are fixed. Although the physical size of rooms can be larger or smaller, the mix is always sent to those assigned point speakers, so the experience from room to room may be inconsistent. By comparison, Dolby Atmos gives re-recording mixers a way to mix to an idealized space instead of fixed speaker positions. This means a Dolby Atmos mix, when played in a Dolby Atmos room, takes into account the actual dimensions of the space, as well as the number of speakers that are used, to recalculate audio playback to suit that exact space and playback equipment, giving a more faithful recreation of the mix with much more specific sound placement, when necessary.

To give a clear example of the benefits of Dolby Atmos, think of a small theatre that has standard left, center, and right front-screen speakers. It then has four left surround and four right surround, four overhead left, and four overhead right. For this example, let's say you have sent a sound to the surround left in Atmos, positioned at about one-half of the distance from the screen.

Now move the Atmos mix to a much larger room with twice as many monitor speakers. The new theatre has eight left surrounds, eight right surrounds, eight overhead left, and eight overhead right. Playing in this new configuration, Atmos automatically calculates the ratio of the room and the new speaker array. In this example, when that sound is reproduced at one-half of the distance from the screen, Dolby Atmos calculates the ratio of the sound in relation to the new playback setup, so the listener hears exactly what the re-recording mixer intends.

For this example, let's say to have that audio playing back at one-half of the distance from the screen in the small room, the audio is played on the second surround speaker on the left. When this same audio is played in the larger room, Atmos determines that the fourth surround speaker is one-half the distance from the screen. The importance is not what speaker sounds are assigned to but rather where in space the sound should be heard. Atmos calculates the ratio of the playback spaces and monitor speakers to faithfully reproduce a mix, rather than assign sounds to a fixed speaker position.

Dolby Atmos Speaker Configurations

It is important to understand that the term Dolby Atmos isn't restricted to describing any particular speaker layout. Dolby Atmos is a complex metadata-driven system that interprets the audio from a configured Atmos mix, determines the playback system of the end user, and calculates the mix to fit each particular space and system. Assuming the possession of a Dolby Atmos compatible system, if a 9.1.6 Atmos mix is played by someone with only a two channel playback system, then it will intelligently down mix the 9.1.6 Atmos to stereo. If a user has a standard 5.1 monitor system, then the 9.1.6 Atmos soundtrack will down mix to five channel surround with a subwoofer.

The naming of the channel configurations in the Dolby Atmos format includes the height channels in the nomenclature. Channel configurations are presented as three digits separated by periods, such as 7.2.4, which is a typical speaker configuration. The first digit describes the number of main, or ear-height monitoring channels that surround the listener. The second digit describes the number of subwoofer channels. The third digit describes the number of height channels, which are speakers positioned on, or in the case of a soundbar pointed to, the ceiling.

An example of a 7.2.4 Atmos monitor speaker configuration:
- Seven surround channels
  - Left
  - Center
  - Right
  - Left Surround
  - Right Surround
  - Left Back Surround
  - Left Right Surround
- Two Subwoofers
- Four height channels

Enabling Dolby Atmos

Atmos must be enabled by going into Project Settings > Fairlight tab > Immersive Audio and turning on Enable Dolby Atmos. When enabled, the Change Track Type contextual menu when right-clicking on a track will then include the additional Atmos track types.

The Components of a Dolby Atmos Mix

Mixes created in Atmos have several specifically identified components. These work together to create an immersive mix, but each element allows the Dolby Atmos system to fit the sound specifically to the space and speaker configuration during playback. These consist of:

- **The Bed track:** Contains the bulk of mixed audio, including dialog, ambient sound effects, and music. These sorts of sounds will contain panning information, but the panning will be general. Wind, traffic in the distance, room tones, and sync dialog would all most likely fall within the bounds of a standard bed track of 7.1.2 or 9.1.6. These are tracks with fixed monitor locations.

- **Object tracks:** Pinpoint the placement of sounds moving specifically across the immersive space. Users can use these specific tracks to create panning anywhere in the room. Object tracks use the Atmos metadata to do the calculations discussed in the last example. ADM files are Atmos exports used with the IMF file type as master deliverables, which are in the broadcast wave file format.

It's up to users to define which tracks are Bed tracks, and which are Object tracks; these track designations, are descriptions of what the tracks you create are going to be used for. Ultimately, it's up to the mixer which audio is organized on Bed tracks, and which is organized on Object tracks. Theoretically, users can create a mix consisting entirely of Object tracks if desired, but typically the mix would be split into beds consisting of generally panned sounds, and Object tracks for sounds requiring specific room placement.

Object tracks and height channels open up possibilities that were never possible prior to Atmos. Imagine a scene where a man is hiding from Police while a helicopter circles overhead, or a scene where kids are in a basement and are startled to hear loud footsteps above them. With Atmos, the audience can now experience these immersive sounds along with the characters.

These are real-world examples, but sound in animation, science fiction, and fantasy can explore space in ways that are only limited by the creator's imagination. Flying fairies or creatures can move about the space front to back, high and low. Perhaps there's a scene with a ship moving full speed ahead underwater, breaking up and out into the sky, flying and dodging weapons coming from all sides. Object tracks are ideal to pinpoint sound effects requiring spatial specificity, but more importantly, Atmos assures the re-recording mixer that the final choices made in the mix will be faithfully recreated from theatre to theatre, and from room to room.

ADM Authoring and Export to IMF Deliverables

DaVinci Resolve 17 adds Dolby Atmos ADM file creation and manipulation, as well as the ability to export Atmos masters as IMF deliverables. IMF (Interoperable Master Format) is a SMPTE standard for a single master file format that incorporates all the media and metadata necessary to deliver what's necessary. Atmos mixes in Fairlight use all the same controls and effects as any other surround sound mix; EQ, dynamics, effects, and automation all work much the same. The biggest difference is you'll be using the 3D Space panner, rather than the Surround panner.

ADM Import

Importing an ADM file into a project will open the Bed mix or mixes and any associated Object tracks into a timeline. They will be imported onto corresponding track types of the audio files embedded into the ADM. For instance, if a Bed file is 7.1.2, then on import that file will open in a 7.1.2 track in Fairlight. Object files will be created as separate tracks in Fairlight containing all of their panning data. Object tracks can only be mono or stereo files due per the Dolby Atmos specification.

New Surround Buses in Fairlight

The new Flexbus structure in Fairlight enables user-definable buses. Atmos mixes call for several bus formats that are now available in DaVinci Resolve 17.

– 9.1.4

– 22.2

New Features and Enhancements

DaVinci Resolve 17 adds numerous improvements to Fairlight editing and mixing.

## Updated Fairlight Engine Supports 2,000 Audio Tracks

The completely redesigned Fairlight Audio Core engine allows for simultaneous playback of up to 1,000 tracks with no additional hardware, and up to 2,000 tracks when used with the Fairlight PCI Audio Accelerator. The new engine also utilizes self-learning load balancing for maximum plug-in support.

It's tempting to think, "What would I possibly do with up to 2,000 tracks?" However, Fairlight's increased track count meets the demanding needs of both clients and immersive formats, such as Dolby Atmos. Major studio films and series television requires high track counts to accommodate complex mixes and the export of multiple deliverables. On top of that, immersive formats, such as Dolby Atmos, multiply the necessary track counts with their demands for deliverables from 7.1 up to 22.2.

Bus to Bus Routing and Mixing

The new Fairlight audio engine has unleashed advanced capabilities in the bus structure within Fairlight. The new Flexbus structure offers complete user flexibility for bus types and signal routing, which changes the prior Main, Sub, and Auxiliary bus formats to be completely user-definable. This new structure makes it possible to patch outputs and/or sends in any way you need, as dictated by your project. Each track can now output to up to ten buses and sends with additional level and pan controls to a further ten buses. Buses can be sent to other buses up to six layers deep, facilitating complex stem building, processing, and allowing discrete deliverables.

User-definable buses allow for bus-to-bus, bus-to-track, or track-to-bus routing, with each bus having the ability to pass signals from mono to fully immersive formats, such as Dolby Atmos, at the user's discretion. As with any and all of the tracks in Fairlight, these bus types can be changed at any time by the user if needed,
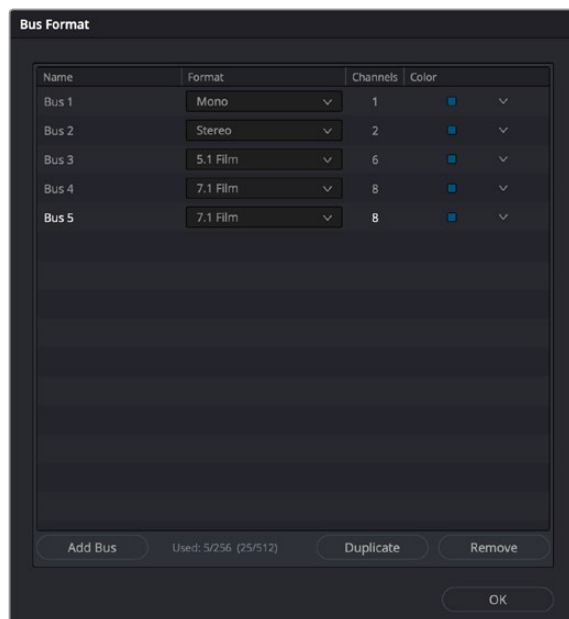
The Flexbus structure allows for many different bus track types to be created or changed

The power of the Flexbus system is that it allows users to direct signals to many different places at one time to achieve complex mixing scenarios. Perhaps you need to generate two mixes that are identical in content but need to be of different output levels. You can designate two mix buses, one with an output level of -2db true peak and one with an output level of -10db true peak. The final mix signal is sent to one bus that is then broken into two more buses, one with a limiter set to -2bd and one set to -10 db creating these two different mixes at one time.

> ### Using Legacy Fixed Busing
>
> If you want to work using the previous method of fixed bus mapping, you can do so for new projects by opening the Fairlight panel of the Project Settings, and turning on the "Use legacy fixed bus mapping" checkbox. This checkbox can only be enabled in new projects in which no timelines have yet been created. Once you've created one or more timelines, this option is locked to whatever it was set to. Older projects have this setting enabled by default to preserve the previous mix.

Picture lock can be an elusive thing, eventually devolving into multiple timelines named final_final_no_really_final_mix. Because editing will always be necessary while projects are in the mixing phase, users now have the option to have their edits retain all of the automation data that has been added to audio clips after mixing. To enable this, choose Fairlight > Automation > Follows Edit.

This is also extremely useful when doing an initial edit of audio clips that contain automation data. For instance, if you have a recurring sound effect that pans left to right, automate that panning to the audio clip. New copies of this audio clip copied through the Timeline will retain the same panning automation. This can save time for a variety of edits that require the same automation data for audio clips in a timeline. Be aware, however, that it will need to be turned off when automation applied is not relevant to the new edits.

In a larger edit change you might have a whole sequence move from one place in the edit to another. For instance, if there is an exterior car scene with lots of passing cars, dialog, and music, all mixed to picture; if this scene is lifted in its entirety, it will continue to have all of the mix automation attached.

The automation data is embedded into the clips themselves. Any of that data, for instance volume or panning, will travel with the clips. So if a complete section has been removed, all of the automation inside of the clips contained in that section are also removed. If a section of clips changes its location in the Timeline, all of the automation embedded in those clips move in the Timeline with them.

Shortcuts for Changing Clip Gain on Fairlight Page

The Clip Gain menu commands were previously only available on the Edit page, but now they're available to the Fairlight user as well. To change clip gain in the Fairlight page, choose an option from the Clip > Audio submenu where you have commands to increase or decrease clip gain by either 1db or 3db. Keyboard shortcuts make these commands considerably more useful.

Waveform Display Has Been Improved

Waveforms now have a zero crossing indicator line. A waveform is an image representation of sound continually moving positive to negative, and the zero crossing point is the level at which that fluctuation occurs. When zooming into a waveform at the sample level, the waveform now displays the zero crossing line to enable precise editing.

Seeing the zero crossing is useful when editing audio, since clean edits are made at the zero crossing to avoid inducing clicks or pops. A cross-fade between two audio clips automatically brings both sides of the fade to the zero crossing.
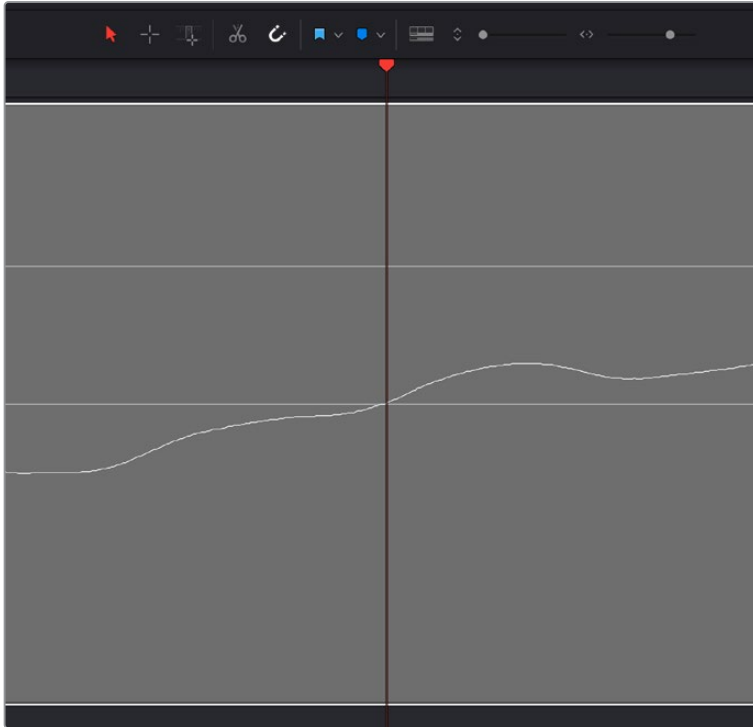
The center line in the waveform indicator is the zero crossing

Linked Clips in the Fairlight Page

Clips can now be linked together right in the Fairlight page. When multiple clips are linked, Fairlight editing commands treat all linked clips as if they were a single clip. Anything you would do to a single clip is done to all linked clips at once. Selecting one item of a linked clip selects all items. Editing the In point of one item of a linked clip edits them all.

To link two or more clips together:

1   Select all clips you want to link together.

2   Right-click one of the selected clips, and choose Link Clips from the contextual menu.

A link indicator at the bottom left of every clip you've just linked shows their new linked status.

Track Names Can Be Edited in the Mixer

DaVinci Resolve 17 adds the ability to edit track names within the mixer window on the channel strip itself. Simply double-click the default name above the fader, and type the new name into the text field. The new track name appears across the project, so track name changes appear on both the Fairlight page Timeline and the Edit page Timeline.

It's common to add tracks as you're building a mix and focusing on the Mixer interface. The ability to name new tracks directly on each channel strip offers a quick way to organize new or changed tracks and/or buses, since you no longer need to display the Track view to rename newly created tracks.

Editable VCA Group Names

VCA Group names can now be easily changed in the Mixer panel by clicking into the text field of a VCA track.
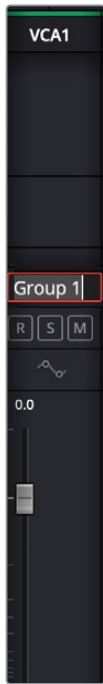
Each group is assigned to a different audio type seen in the Group window

Absolute Scales and Dialog

While some users prefer to measure their levels to correspond to a relative scale of "0," similar to a VU meter where the needle rides above the "0," others want to see the absolute measure of the amplitude in LUFS and true peak. By default, the Loudness meter is set to relative scale, but you now have the option to choose between relative scale and absolute scale in the Loudness meter.

Relative scale in the Loudness menu is relative to the selected scale, so a loudness unit of 0 corresponds to the target of the chosen measure type. For instance, if EBU R128 is selected, whose target measure is -23db LUFS, the "0" LU (Loudness Unit) is -23db. If ATSC A/85 is chosen, whose target is -24db, then that becomes the corresponding equivalent of the relative LU of 0.

When using the absolute scale, the Loudness meter displays the increments to reflect the the chosen measure type. In absolute scale the EBU R128 meter will display -23 instead of the relative scale's 0.
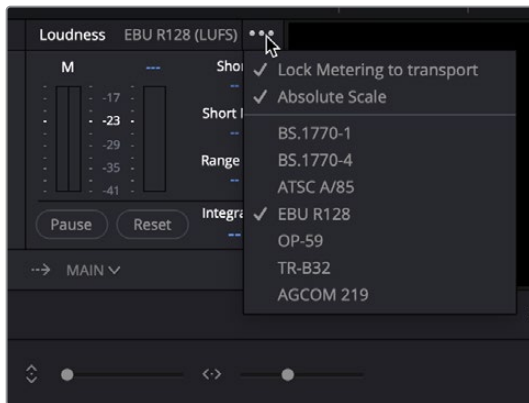
The option in the Loudness panel reveals the various measure types as well as the option for absolute scale

Offline Loudness Analyzer

Users now have the ability to analyze an audio file's loudness offline. This is a fast way to measure loudness in imported audio files or bounced mixes.

To initiate offline loudness analysis:

- Right-click the file in the Timeline, and choose Analyze Audio Level from the contextual menu. A dialog box displays the available options for measurement.

All of the measurements available in the real-time loudness meter are accessible in the drop-down menu inside the Analyze Audio Level panel. When the analyzer mode is chosen, the target measurements for that mode will display next to the reading in parenthesis. Once you have clicked the analyze button, the results will display in the panel next to the chosen mode's target measurement values.
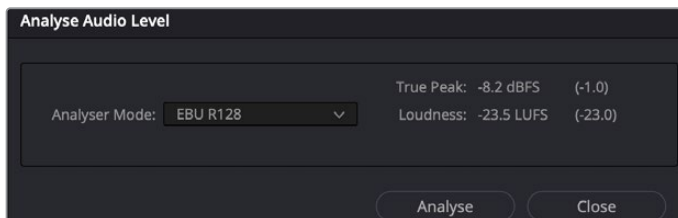

Select the audio file, choose the desired analyzer mode, in this case EBU R128, and click analyze

Multi-Channel Exporting

Audio clips linked in the Timeline can be exported to a multi-channel file.

To link clips:

- Right-click the files in the Timeline and choose Link Clips from the contextual menu.
- Right-click the linked clips and choose Bounce to disk from the contextual menu, making sure to set the bounce to multi-channel.
- The Bounce to Disk dialog box allows for choosing Bit Depth, File Name, Tag, and Folder destination.
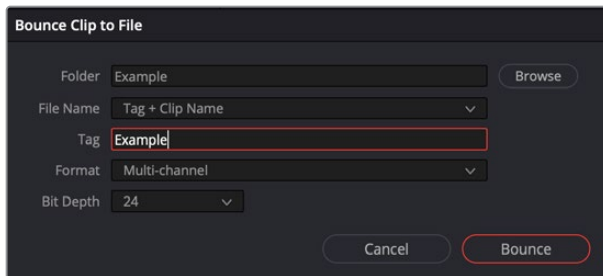
The Bounce Clip to File dialog box offers naming,
destination, and user-defined bit depth

Multiple Selection of Mixer Tracks

Fairlight now offers the option to select multiple channel strips in the Mixer panel, which in turn selects those tracks in the Timeline. These selections can be made by command-clicking each track you want to add to the selection, or by clicking on one track and then dragging a bounding box around all other tracks you want to select.

Reversing Audio Clips

You can quickly reverse clips in the Fairlight page Timeline. To do so, select one or more clips, right-click one of the selected clips, and choose Reverse Clip from the contextual menu.

Reversing an audio clip that's linked to a video clip will reverse them both. If you don't want this to happen, open the Edit page, select the audio/video clip you want to work on, and choose Clip > Link Clips (Option-Command-L) to unlink them. Keep in mind that unlinked clips will not move together on the Timeline, so after you've reversed and unlinked an audio clip, you can relink it to the accompanying video clip by selecting both on the Edit page and using the same command.

Ability to Delete All Empty Tracks

You can now remove all empty audio tracks in the Fairlight timeline by right-clicking any track header and selecting Delete Empty Tracks from the contextual menu.

Typically, as a sound edit progresses, audio files are swapped between tracks and/or deleted altogether. With this new function, you can remove all tracks that no longer contain audio clips with a single click. With the highly increased track count now available, this will definitely simplify the clutter after an intense sound-edit session.
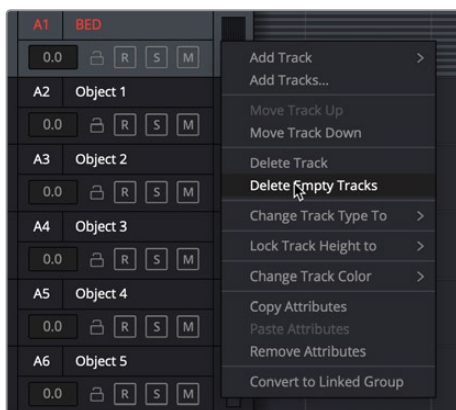

Right-clicking on a track or the track field reveals
the Delete Empty Tracks function

Per Timeline Views

Each Timeline in the Fairlight page now maintains its own zoom level, selections, range, and playhead position, independently of all other timelines.

Change Track Type for Multiple Selected Tracks

Typically, when sound editing, the edit will require the creation of additional tracks and buses. Sometimes this requires changing a series of tracks from stereo to mono, or to any of the available immersive formats. You can now change the track type of multiple selected tracks all at once by right-clicking one of the selected tracks, and choosing an option from the Change Track Type To submenu. You can do this to tracks regardless of whether or not they have audio clips edited into them.
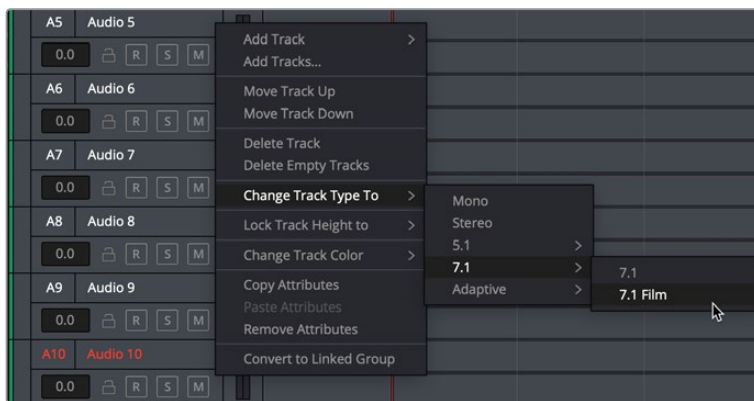
Right-clicking on a single track of multiple tracks selected changes
all highlighted tracks to the new track type

Mute and Solo Can Be Set For Multiple Selected Tracks

You can now Mute and Solo multiple selected tracks using commands in the Timeline menu (Mute Track, Solo Track, Clear Solo). These commands don't have keyboard shortcuts by default, but you can assign them using the Keyboard Customization window, available form the DaVinci Resolve menu.

Menu Command for Initiating Recording

You can initiate recording by choosing Playback > Record. This command doesn't have a keyboard shortcut by default, but you can assign it using the Keyboard Customization window, available form the DaVinci Resolve menu.

Dock, Float, or Cinema Viewer on Fairlight Page

Sometimes when you need to verify lip sync, sound effects sync, or simply review a new section of a mix you've been working on, it helps to watch the visuals of the program full screen as you listen to your mix. You can now set the Fairlight page Viewer to Cinema Mode by choosing Workspace > Viewer Mode > Cinema Mode (Command-F).

Prior versions of DaVinci Resolve only allowed access to the Cinema Viewer when in either the Cut page, Edit page, or Color page. Under the Menu option, Workspace, you can access the Cinema Viewer mode.

AES31 Audio Timeline Import

The AES31 standard is an open file interchange format, developed by the Audio Engineering Society, that allows you to transfer projects from one workstation to another, retaining time positions of events, fades, etc.

AES31 uses the widely used Microsoft FAT32 file system with Broadcast Wave as the default audio file format. You can transfer AES31 files to digital audio workstations that support AES31, regardless of the type of hardware and software used.

Updated Inspector Design With a New Tabbed Layout

The Inspector on the Fairlight page has been updated to match the layout of the Inspector on the Cut and Edit pages. For more information, see Chapter 1, "General Improvements," in this New Features Guide.

Tooltip Shows Monitoring Level

When hovering the pointer over the monitor volume level slider, a tooltip displays the level in dB.
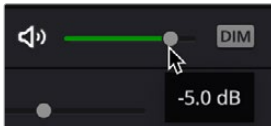

Hovering over the slider indicates
the monitor level being output from
Fairlight to your playback system

Pro Tools Keyboard Customization Preset

Fairlight has added Avid Pro Tools keyboard commands that can be selected, in addition to the custom command sets that already exist for Avid Media Composer, Adobe Premiere Pro, and Apple Final Cut Pro. You can choose a new keyboard command set from the Keyboard Customization window.

Support for Analyzing and Navigating to Audio Transients in a Track

DaVinci Resolve 17 adds the ability to automatically identify transients inside of audio clips. Transients are abrupt, high-amplitude beginnings of sounds that are good for identifying points-of-interest such as the start of words, the beginnings of sound FX, and beats. Once detected, transient markers are drawn for both visual reference, for use in playhead navigation and selection, and for alignment of multiple sections of music by the beats that have been detected.
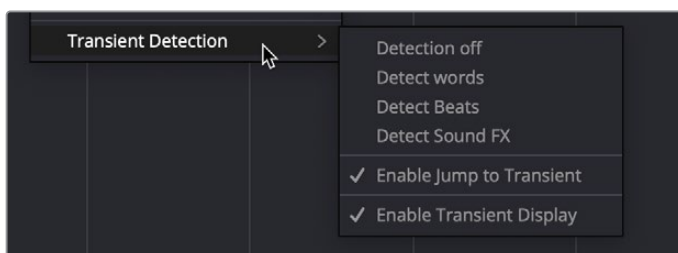
The available options for enabling transient analysis and navigation

Methods of detecting and using audio transients:

- **To Detect Audio Transients:** Right-click anywhere on a timeline track, either in the background or on a clip, and choose Transient Detection from the contextual menu. You can choose from three types of transient detection, depending on the content of that track, with options including Detect Words, Detect Beats, or Detect Sound FX. Transient detection is enabled on a track-by-track basis. Enabling transient detection on a particular track (using the timeline or clip contextual menu) will find the transients for all audio clips on that track.

- **To See Audio Transients That Have Been Detected:** Right-click any track and choose Enable Transient Display. All transients on that track will be shown.

- **To Use Audio Transients for Navigation:** Right-click any track and choose Enable Jump to Transient. To navigate from transient to transient, press the Up or Down Arrow keys on your keyboard to move the playhead back and forth among each transient marker.
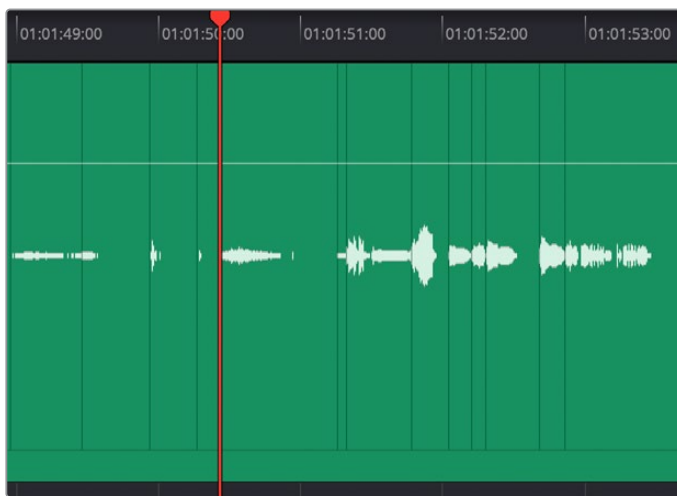
Transient markers on a clip with dialog detected

## Improved Editing and Selection Behavior in the Fairlight Timeline

The Fairlight page now automatically scrolls when dragging clips past the current page boundaries. Nudging clips now moves the cursor. When clicking a timeline marker, the playhead immediately navigates to that new position, and when performing timecode entry, the playhead moves to the new timecode position.

Previewing Video When Sliding Clips, Markers and Ranges

When moving markers and sliding clips in the Fairlight page, the Viewer updates as you move them.

Improved Metering Displays for Timelines with a Large Number of Audio Tracks

With a thousand tracks of audio or more, metering can be a challenge. DaVinci Resolve 17 adds stacked metering to watch audio levels. Double-clicking in the Track or Bus area of the Meters panel toggles between one row and two row views.
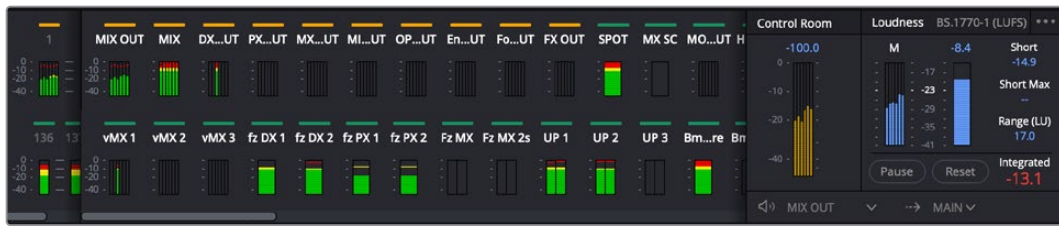
The new double row metering view

Improved Keyboard Mappings for Edit Selection Mode

The Fairlight timeline is listed as a module in the keyboard customization window, with new default keyboard shortcut assigned to them.

Support for Talkback Microphone in the Fairlight Audio Interface

Users now have access to phantom power, gain levels, and input selection when the Fairlight Audio Interface microphone in is used for talkback in the Talkback Settings dialog box.

New Fairlight FX

DaVinci Resolve 17 introduces an important new Fairlight FX.

Loudness Analyzer

The Surround Analyzer is a graphical meter that shows a spatial image of the audio being measured, rather than a typical bar graph meter. Due to its changing shape because of the signal being played, sometimes it is referred to as the "jellyfish meter."

This type of metering is very useful; rather than relying on bars to indicate the directions in which audio is radiating, you can clearly see the relationship of all of the channels to one another.
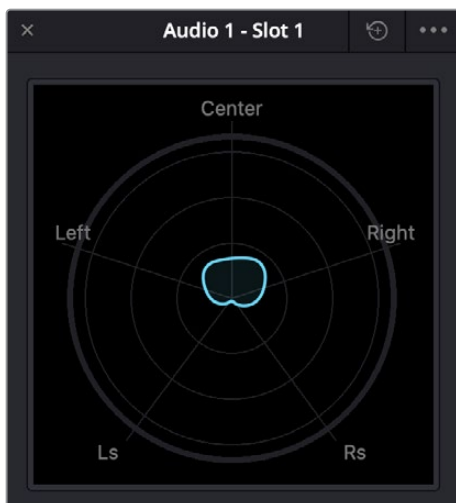
The signal here is radiating more to the right, indicating the panning of the audio

Chapter 10

Deliver Page Improvements

DaVinci Resolve 17 brings numerous improvements for project delivery, focusing on more advanced settings for professional workflows.

Contents

General Deliver Page Improvements

Resolve 17 has added some technical and usability improvements that apply to the entire Deliver page.

Media Offline Warning at Render Queue

When you attempt to add a job to the Render Queue with a timeline that contains any offline material, DaVinci Resolve now automatically gives you a warning. You may choose to either cancel adding the job, or to add it anyway, knowing you're about to render one or more offline clips.
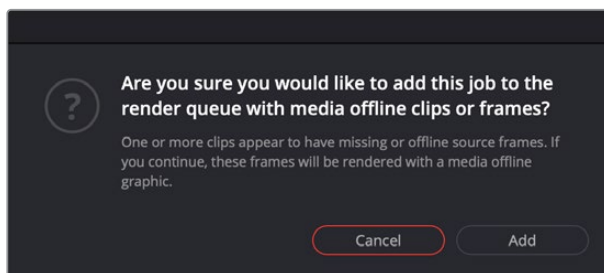
Media Offline warning box that appears if your timeline contains offline clips or frames and is added to the Render Queue

Support for Using Multiple Databases in Remote Rendering

You can now set up remote renders for projects in all connected Davinci Resolve databases. Previously, remote rendering would only work with the currently active database. To activate this feature, check the "Automatically scan other databases for Remote Rendering jobs" box in the General settings of the System tab, of the DaVinci Resolve Preferences. For more information on Remote Rendering, see Chapter 166 "Rendering Media" in the DaVinci Resolve Reference Manual.

New Features

The Deliver page also has some new features for more advanced workflows.

Script Triggers in the Render Settings

You now have the option of triggering a script to execute before or after rendering a timeline, by checking the "Trigger Script at" box in the Advanced Settings section of the Video tab in the Render Settings. You can select the specific script to execute using the corresponding drop-down menu.

Scripts must be written for the Resolve scripting framework in either Python or Lua, and placed in the following directory:

- **MacOS:** /Library/Application Support/Blackmagic Design/DaVinci Resolve/Fusion/Scripts/Deliver/
- **Windows:** C:\ProgramData\Blackmagic Design\DaVinci Resolve\Fusion\Scripts\Deliver
- **Linux:** /opt/resolve/Fusion/Scripts/Deliver

"Render Codec" Metadata Variable

You can now add the Render Codec as a metadata variable when creating a custom file name or render path. To use this new variable, press the "%" key in the filename or location fields in the Render Settings, then start typing the word "render." You can then select Render Codec from the scrolling list using the arrow keys.

Specific Format Export Improvements

DaVinci Resolve 17 has introduced a significant improvement to IMF and DCP exporting, as well as updates to the Pro Tools Render Setting.

Support for Rendering IMF Segments and DCP Reels

DaVinci Resolve now supports splitting IMF and DCP projects into separate segments and reels, in addition to rendering media as a single file. This can be useful for breaking up your timeline to fit within allowed file sizes on legacy file systems, separating marketing and studio assets from the final film, or just being able to replace certain sections of the film without having to re-encode the entire file.

To Render an IMF Segment or DCP Reel:

1   Choose IMF or DCP from the Format Settings in the Video Tab of the Render Settings panel.

2   Navigate to the "Segment list" or "Reel list" section of the Composition Settings.

3   Choose from the following options:

– **Single segment / reel:** Encodes the Timeline into a single file (default setting).

– **Regular intervals of:** Encodes the Timeline into multiple segments/reels, each one the duration of the value set in the "mins" field.

– **Align to clips on the first video track:** Encodes the Timeline into multiple segments/reels, each individual clip on the V1 track of the Timeline becomes its own separate file.

– **Keep audio as single segment (IMF only):** Select this checkbox to keep the audio portion of the IMF as a single file, regardless of the segment options selected above.

4   Press the Add to Render Queue button.
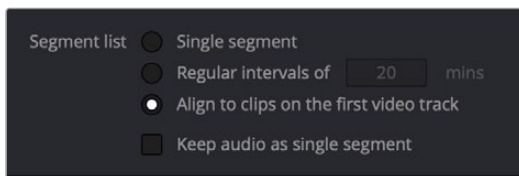
IMF Segment options

Pro Tools Wave Export of Multichannel Audio

Recent Pro Tools updates have allowed for specific kinds of multichannel audio file support. DaVinci Resolve 17 has updated its Pro Tools Render Settings to accommodate this feature.

The standard mono round trip export from DaVinci Resolve to Pro Tools remains the default setting, with the "Render one track per channel" box checked in the Audio tab of the Pro Tools Render Setting in the Deliver page. With this option, a 5.1 polyphonic .wav file would be exported as six individual mono .wav files.

With this new feature, if the "Render one track per channel" box is unchecked, DaVinci Resolve will output multichannel polyphonic .wav files instead. If you do this, it's important to check in advance that Pro Tools supports the particular multi-channel formats you want to export before committing to this workflow.